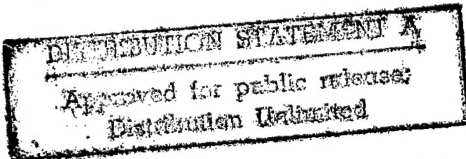


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WASTE WATER TREATMENT PLANT AND INCINERATOR COMPLEX,
SITES 5EP2447 AND 5EP2446,
FORT CARSON, COLORADO

James Schneck
and
Karin M. Roberts

Prepared for and funded by

The Directorate of Environmental Compliance and Management,
Headquarters, Fort Carson,
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TECHNICAL ABSTRACT

The Fort Carson Waste Water Treatment Plant (5EP2447) and Incinerator Complex (5EP2446) serve as important examples of World War II-era military complex support facilities. These two adjacent sites were determined significant and contain 32 contributing and 33 non-contributing buildings and structures. This report is submitted in accordance with stipulation 1(d) of the Memorandum of Agreement among the Department of the Army, Headquarters Fort Carson (HQ-FTC), the Colorado State Historic Preservation Office, and the Advisory Council on Historic Preservation. Recording these structures was deemed pertinent after HQ-FTC proposed upgrading the present facility to meet modern standards.

POPULAR ABSTRACT

Camp Carson, later renamed Fort Carson, was constructed in 1942 near Colorado Springs, Colorado, in response to the need for wartime facilities. The Waste Water Treatment Plant (5EP2447) and the Incinerator Complex (5EP2446) were constructed as support facilities for the newly erected Camp Carson. These two adjacent sites were determined eligible for inclusion in the National Register of Historic Places and contain 32 contributing and 33 non-contributing buildings and structures. This report discusses the initial construction and subsequent modifications of these buildings and structures.

ACKNOWLEDGMENTS

A number of individuals have contributed their time and skills to produce the final version of this report. Julie Field assisted with the initial recordation of the Waste Water Treatment Plant structures. She photographed and recorded the non-contributing structures in the field, and developed figure captions.

Pete Heidebrecht, the Fort Carson Waste Water Treatment Plant Supervisor, and his staff assisted in the initial field research, answered numerous questions and reviewed draft copies for accuracy. Dan Golden, in engineering at Fort Carson, provided important technical information about the Plant's past operation. Their expertise is much appreciated.

At the Fort Carson Directorate of Public Works, Bob Riley assisted in locating and reproducing plans of the Plant, and Betty Hammerbeck assisted with Plant research and deciphering the Real Property Codes on Real Property Records.

At the Midwest Archeological Center, Jennifer Galindo provided assistance in preparing figures for the Historic American Building Survey (HABS) and Historic Building Inventory Record forms, and assisted in the research of other World War II waste water treatment plants. Thanks goes out to those contacted about plans of other WWII-era waste water treatment plants including the Massachusetts Air National Guard at Camp Edwards, Falmouth, Massachusetts; the Corps of Engineers at Fort Sam Houston, San Antonio, Texas; the Engineers at Camp Atterbury in Columbus, Indiana; Richard Smith at the National Archive and Records Administration Cartographic Branch; Glen Aarington and Mark Maredeth at Fort Leonard Wood, Missouri; and Bob Neilland at Fort McCoy, Wisconsin.

Also at MWAC, Melissa Connor reviewed draft copies of the report, Carrol Moxham provided guidance in producing the figures, and John Andresen offered editorial suggestions. Stacy Stupka-Burda, University of Nebraska-Lincoln, provided technical support and editorial assistance. AutoCAD figures were produced by Jim Schneck and Karin Roberts.

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INTRODUCTION

Statement of Purpose

This report was prepared to meet the requirements set forth in the Memorandum of Agreement among the Department of the Army, Headquarters Fort Carson (HQ-FTC), the Colorado State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation. According to the Memorandum, HQ-FTC determined that an upgrade of the existing waste water treatment facility was warranted in order to bring the complex up to modern standards. Consequently, the existing structures, previously determined eligible by the Colorado State Historic Preservation Officer, would be affected. This report meets stipulation 1(d) of the Memorandum by providing a technical report with detailed descriptions of each contributing building at the Waste Water Treatment Plant (5EP2447) and the Incinerator Complex (5EP2446).

History of Project

The Department of the Army, Headquarters Fort Carson (HQ-FTC), decided in 1995 that an upgrade of the Waste Water Treatment Plant (5EP2447) (Figures I-1 and I-2) at the Fort was necessary to bring the plant up to modern standards. The National Park Service Midwest Archeological Center (MWAC) in Lincoln, Nebraska, was contacted in January 1996 about documenting the structures at 5EP2447 before work began. There were no plans to alter or modify the Incinerator Complex (5EP2446) located adjacent to 5EP2447, but it was decided to include the site in the Waste Water Treatment Plant report.

Jim Schneck and Julie Field from MWAC documented all the structures at 5EP2447 in April 1996. In addition, photographs were taken of all the non-contributing structures at the Waste Water Treatment Plant. While at Fort Carson, copies were made of related plans on file. In this same month, Hadley Harper produced photographs of the contributing buildings at both the Waste Water Treatment Plant and the Incinerator Complex. After returning to Lincoln, Julie Field produced a list of structure modifications and developed figure captions. Karin Roberts and Jim Schneck produced "Historic Building Inventory Record" forms for the non-contributing buildings and Jim Schneck wrote the narrative for the "Historic Architectural Building Survey" (HABS) form for the contributing buildings. The HABS form for the Incinerator Complex (5EP2446) was updated at this time. These forms were completed in January 1997. Jim Schneck left his position with MWAC at the end of November 1996. At this time, Stacy Stupka-Burda was hired under contract to produce the Waste Water Treatment Plant Technical Report.

Methods

Initial documentation of the Waste Water Treatment Plant (5EP2447) was completed in July 1995 by Chuck Denne and Sandra Barnum, U.S. Army Corps of Engineers, Omaha, Nebraska. A Colorado Historical Society "Historic Building Inventory Record" form was completed for each structure and 35 mm photographs were taken of the structures. The Incinerator Complex

(SEP2446) was first documented in September 1995 by Marilyn Mueller, Directorate of Environmental Compliance and Management, Fort Carson. A Colorado Historical Society "Historic Architectural Building/Structure" form was completed for each structure at the Incinerator Complex at this time, and a "Management Data Form" completed for the site.

In April 1996, Jim Schneck and Julie Field completed documentation of the Waste Water Treatment Plant structures using the "Historic Architectural Building/Structure" forms. Also at this time, these forms were updated for the Incinerator Complex. Julie Field also produced 35-mm photographs of the 33 non-contributing buildings at the Waste Water Treatment Plant. Photographs were taken the same month by Hadley Harper of Hadley Harper Photographics, using a 2 1/4"-x-2 1/4" format, of the 32 contributing buildings at the Waste Water Treatment Plant and the Incinerator Complex.

In November and December 1996, Jennifer Galindo attempted to locate other military complexes with similar World War II-era waste water treatment plants. This research revealed that Camp Atterbury at Columbus, Indiana, and Fort McCoy in Wisconsin each built single-stage trickling filter sewage systems during World War II. Bob Neilland at Fort McCoy provided a copy of the plan for their treatment plant (Figure I-3). Although a single-stage trickling filter like the original Fort Carson plant, the structures are arranged differently. Camp Edwards at Falmouth, Massachusetts upgraded its plant during World War II. The Massachusetts Air National Guard at Camp Edwards was able to provide a copy of plans for these modifications. Other forts were contacted, including Fort Benjamin Harrison, Indianapolis, Indiana; Fort Sam Houston, San Antonio, Texas; Fort Ord, California; Fort Leonard Wood, Missouri; Fort Riley, Kansas; Fort Jackson, South Carolina; and Fort Gordon, Georgia. These forts either did not have WWII-era plants or the appropriate person did not respond. The National Archive and Records Administration Cartographic Branch in Maryland and the Construction Engineering Research Lab in Illinois were also contacted.

Historic American Building Survey (HABS) Level II narratives were completed for the 32 contributing buildings at the Waste Water Treatment Plant and the Incinerator Complex in December 1996. The narratives included archival quality photographs of the contributing structures, as well as reproductions of building plans. Building plans for most of the structures are on file at the Directorate of Real Property, Directorate of Public Works, Fort Carson. Reductions were made of these plans on archival quality paper for inclusion in the HABS narratives.

Christopher D. Dore of Archaeological Mapping Specialists, Lincoln, Nebraska, was contracted to create two corrected and interpreted aerial photographs of the Waste Water Treatment Plant. One was produced using a NAPP 1993 aerial photograph and the other using a NRCS 1955 aerial photograph. However, problems were encountered with the resolution and accuracy of the aerial photographs. Documentation of these problems as well as the corrected photographs are included in Appendix A of this report.



Figure I-1. Aerial Photo of Fort Carson Waste Water Treatment Plant and Incinerator Complex.

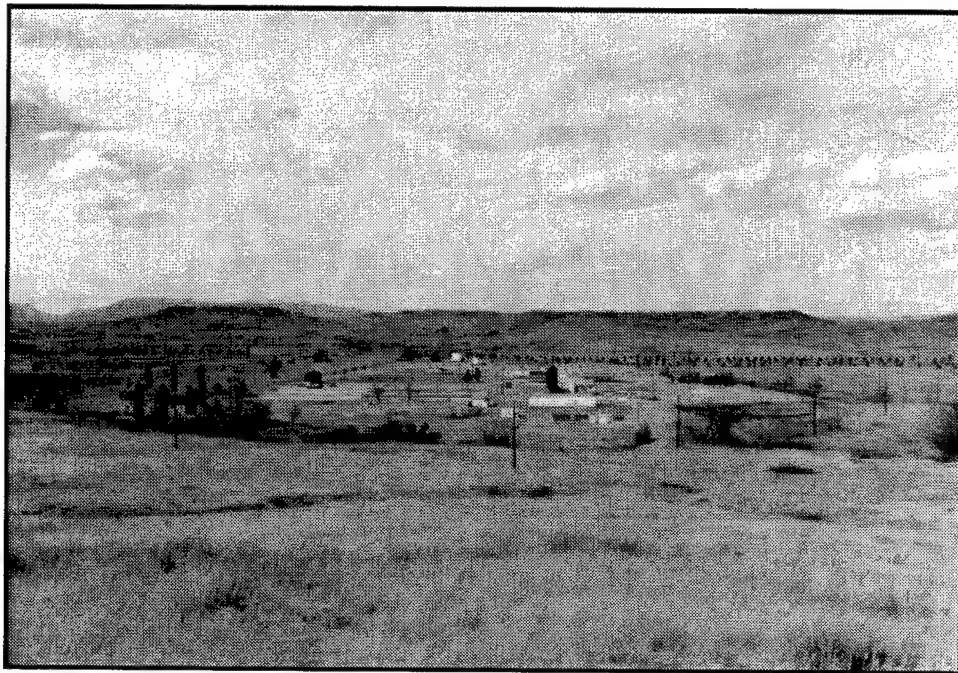


Figure I-2. Overview Photograph of Waste Water Treatment Plant. View to the north. Roll MWAC2, Exposure 20.

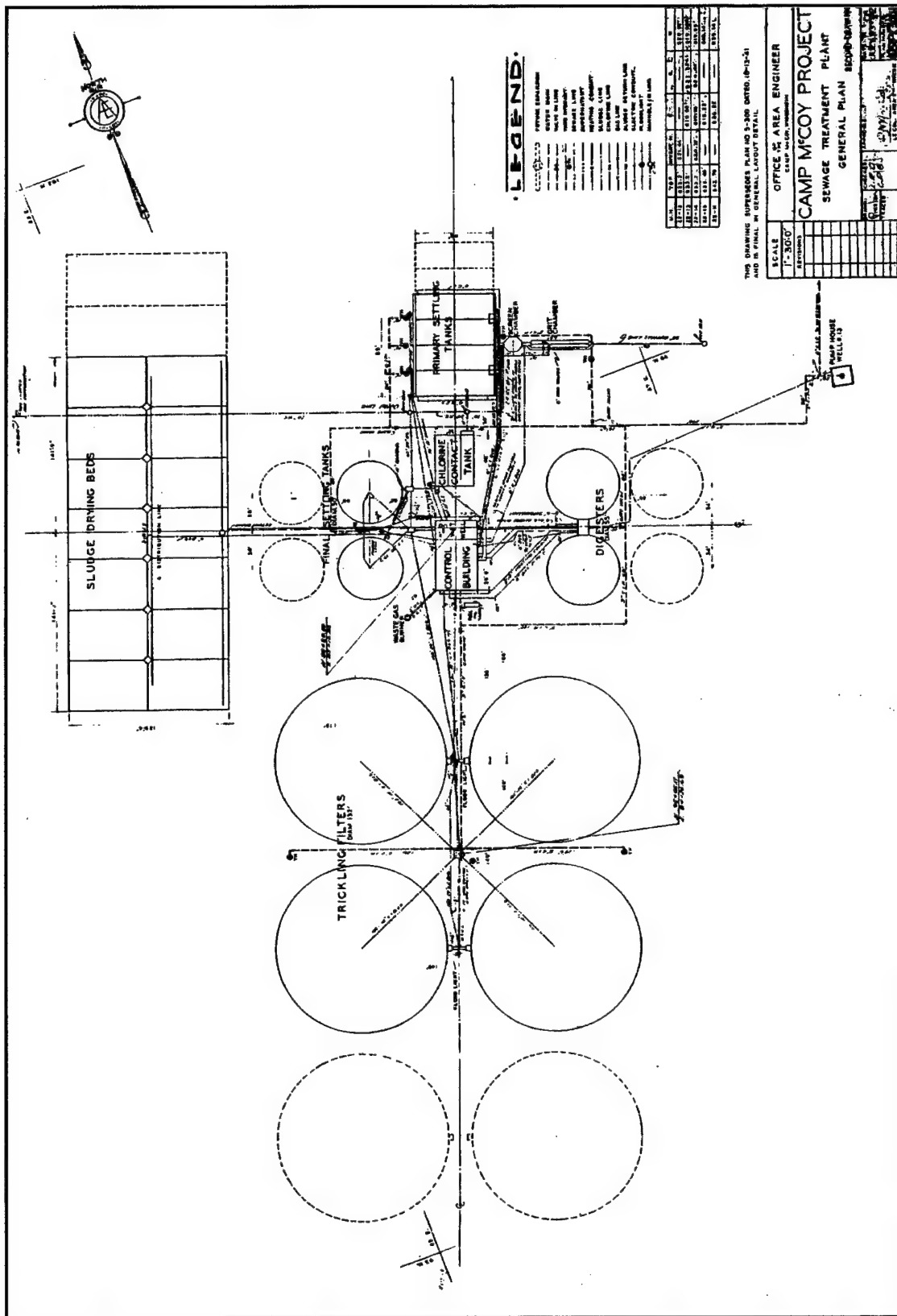


Figure I-3. Camp McCoy Waste Water Treatment Plant.

THE WASTE WATER TREATMENT PLANT AND INCINERATOR COMPLEX

A Brief History of Fort Carson

Camp Carson was initially a temporary installation constructed as part of an effort to place human and material resources in a state of readiness for the second World War. The Army announced in January 1942 that Camp Carson was to be established near Colorado Springs, Colorado and construction began soon thereafter. In fact, the first building at Camp Carson was completed on January 31, 1942. More than 1,650 buildings were quickly constructed at the Camp Carson site during 1942 and 1943, including the Waste Water Treatment Plant (Figure II-1). The project brought thousands of workers and millions of dollars worth of materials to the area and caused an unprecedented economic boom in Colorado Springs and the surrounding areas.

Two divisions were scheduled to be stationed at Camp Carson, consisting of 14,615 enlisted men and 630 officers (Connor and Schneck 1996:III-1). During the War, 104,165 men were trained at Camp Carson. After World War II, troops continued to be trained at Camp Carson. Camp Carson became a permanent installation in August 1954 and its name was changed to Fort Carson. Fort Carson underwent an expansion in the mid-1960s as the Army prepared for Vietnam. During this time, approximately 30,000 troops were stationed at Fort Carson (Connor and Schneck 1996:III-3, III-4).

Initial Construction

Construction of the Waste Water Treatment Plant (WWTP) was carried out by the A.S. Horner Company of Denver, Colorado. This company was a sub-contractor of the Colorado Springs Constructors, Incorporated, a partnership of builders who held the general contract for construction of Camp Carson. According to a newspaper article at the time, the new sewage treatment plant was to be "one of the most modern units of its kind in the west" (Gazette-Telegraph March 29, 1942).

Plans developed by the U.S. Army Construction Division's Office of the Quartermaster General were used in the plant's construction. Many additional design firms participated in subsequent projects.

Preliminary plans for Camp Carson, including the WWTP, were developed by the firm of Fisher, Fisher and Hubbell and Paulette and Wilson, Associated Architects and Engineers. The firm prepared engineering studies for the camp's layout and basic building plans and specifications used to solicit construction bids. The work was overseen by the U.S. Army Construction Division's Office of the Quartermaster General. Some designs were based upon 800 Series designs for temporary construction (Legacy Resources Management Program 1991). These drawings became known as the Sewage Treatment Plant (STP) Series at Fort Carson.

Construction planning and supervision was delegated to the Corps of Engineers in late 1941. In January 1942, construction work was placed under the supervision of an on-site representative of

the United States Engineers Office, based in Omaha, Nebraska. This office also developed drawings used in the plant's construction. Available drawings developed by this branch office date from 1942 through 1973.

Drawings developed for a 1943 expansion were produced by the firm of Crocker and Ryan-Architect Engineer and were overseen by the War Department's U.S. Engineers Office in Denver, Colorado. The firm also developed a series of "as-built" drawings for the complex. These drawings became known as the Colorado Carson Area (CCA) Series at Fort Carson.

In the 1950s the Post Engineer Office at Fort Carson developed its own series of "as-built" drawings for the WWTP. These became known as the Post Engineer Sewer (PES) Series. In 1961 the firm of Henningson, Durham and Richardson, Inc., Engineers Planners and Consultants, developed a series of drawings in preparation for the first overhaul of the WWTP. These drawings also became part of the PES Series. The firm was based in Omaha and had a branch office in Colorado Springs. The U.S. Army Corps of Engineers in Omaha also developed drawings for this overhaul.

Other firms have participated in small projects at the WWTP. Participating firms whose drawings remain on file at Fort Carson include Phelps-Brauer and Associates, Inc., Site Planning Consultants, Denver, Colorado; Nelson-Haley-Patterson and Quirk, Inc., Engineering Consultants, Colorado Springs; and Stanley Consultants.

Shop drawings from several companies that developed plans for new equipment and machinery remain on file. These include Acoustics and Specialties, Denver; Armco Drainage and Metal Products, Denver; Builders' Supply Co./Cobusco Steel Products, Denver; Rocky Mountain Division, Denver; Crissey Fowler Lumber Company, Colorado Springs; Dorr-Oliver Incorporated, Stamford, Connecticut; General Services Company, Corvallis, Oregon; Infilco Inc., Tucson, Arizona; Midwest Steel and Iron Works Company, Monarch Engineering Company, Inc., Salida, Colorado; Pacific Flush Tank Company, Chicago and New York; and Utility Control Corp., Automatic Control Systems and Equipment, Denver.

Partial sets of drawings are on file with the Fort Carson Directorate of Public Works' Project Management Division, Department of O.M.A. Contracts. Some mylar and blueprint plans of recent additions are stored at Building 3880.

Camp Carson buildings were named and numbered according to their function and type of construction. Numeric designations included the letter "T," which reflected the "Temporary" status of all buildings initially constructed at Camp Carson. Some buildings' numbers have changed over time. The numbers used in this report match present building designations. Buildings 3875, 3878, 3882, 3885, 3890, 3891, 3893, 3894, and 3899 are identified as "Diversion Boxes" throughout this report. Some plan series instead use the term "Distribution Box." Filter Head Boxes 3882 and 3885 were sometimes also identified as Diversion or Distribution Boxes.

Two separate sanitary sewer systems and sewage treatment plants were constructed at Camp Carson. One served the Field Artillery Pack Battalions, the other the balance of the Cantonment.

The two systems were considered to be less expensive and easier to construct than a single plant, which, because of elevation variations, would have required an additional pumping station. The field battalion plant had a simple Imhoff type system and the WWTP had a single-stage trickling filter type system. Typical military Imhoff systems of the time utilized a four-step process involving screens, Imhoff tanks, sand filtration, and chlorination. Imhoff tanks are multi-function structures that both settle and digest sludge. Of the several waste water processing systems utilized by the Army after World War I, the trickling filter type systems were the most common (War Department 1945:96).

The Completion Report for Camp Carson included the following section on the WWTP. The brackets contain present building numbers not part of the original report.

The sewage treatment plant serving the Cantonment proper is designed for a population of 35,000. The design average flow is 70 gal./cap./day, resulting in an average flow of 2,450,000 gal./day with a maximum short-time peak of 7,350,000 gal./day. The plant is an Aero-filter type, consisting of one (1) screen chamber [Screen House 3870], two (2) primary clarifiers [3877,3879], two (2) high-rate filters [Trickling Filters 3884, 3886], two (2) final clarifiers [Secondary Clarifiers 3892, 2895], two (2) heated sludge digestors (sic) [3860, 3863], two (2) sludge drying beds [3864, 3865], one (1) wet well for recirculation [3889], one (1) sludge pump building [not extant] housing two (2) sludge pumps, and one (1) chlorinator laboratory building [Laboratory and Control 3887] housing three (3) recirculating pumps. The final effluent is chlorinated [original chlorination buildings not extant] prior to its discharge into the natural drainage channel [Clover Ditch] (War Department 1942:13).

Original buildings not mentioned in the report include Diversion Boxes 3875, 3878, 3891, Diversion Box/Parshall Flume 3893, Filter Head Box 3885, and Digester Control Room 3862.

The sanitary sewage plant was constructed at the southeastern corner of the cantonment. This area was lower in elevation than the Camp, which allowed construction of a gravity-fed sewage collection system. Its buildings were organized in a linear pattern on a pie-shaped area encompassing approximately 10 acres. The sloping site accommodated the plant's gravity-fed process.

Incinerators 3850, 3851, and 3852, and Incinerator Lavatory 3853 were constructed in 1942. This complex sits immediately adjacent to the WWTP to the southwest.

Evolution of the Treatment Process

Technological advances and changing demands have resulted in an almost continuous series of upgrades to the Waste Water Treatment Plant's processing system. Worn or obsolete equipment has also been routinely upgraded. The treatment plant of today is in many ways very different than the treatment plant of 1942.

After its completion in 1943, the plant was managed by Army personnel. As initially constructed, the plant incorporated six steps in a single-phase high-capacity trickling filter treatment

process (Figure II-2). During this type of treatment process waste water was screened, metered, clarified, aerobically filtered through zooglio mass, clarified again, and chlorinated before being released. A hexagonal grit collector identified in 1942 site plans may once have sat approximately 200' northwest of Screen House 3870. This feature was removed several years ago. As originally designed, influent probably passed through this collector before being screened. At each processing stage settled sludge (solid waste) was piped to a two-stage digester complex which stabilized the organic waste, precipitated clear supernatant, and removed harmful bacteria. The stabilized sludge was then piped to sludge beds where it was allowed to air dry before being collected for disposal.

The plant processed only sanitary and industrial sewage. Drainage from the Camp's storm sewers was not processed by the WWTP.

At the WWTP, waste water entered at the northwest corner of the site and discharged at the southeast corner. Influent was screened at Building 3870 to remove inorganic material. The screened influent was then metered at an influent Parshall flume and channeled to Diversion Box 3875, which divided the flow and directed it to Primary Clarifiers 3877 and 3879. Here solids, known as "sludge," settled out of the waste stream.

The flow was then collected at Diversion Box 3878 and piped to Filter Head Box 3885, which divided the flow and directed it to Trickling Filters 3884 and 3886. The filters utilized rotating booms to distribute the waste water evenly through zooglio mass held within a stone media. The filters used organisms, held in a thin film on the stone surfaces, to stabilize solids by aerobic methods. After being collected again at 3885 the flow was piped to Diversion/Collection Box 3891, which divided and directed it to two Secondary Clarifiers, 3892 and 3895. These settled sloughed zooglio material. From the Secondary Clarifiers the influent was collected at Diversion Box/Parshall Flume 3893 and either recirculated or sent through the effluent Parshall Flume, chlorinated, and discharged. Recirculated influent was drawn from Diversion Box/Parshall Flume 3893 into Recirculating Well 3889 where it was pumped back into the waste stream at Filter Head Box 3885. This process supplied a regular flow through the Trickling Filters during periods of low influent flow. Flow recirculation pumps were located in the basement of Laboratory and Control 3887. Effluent not recirculated was piped to the plant outfall and into Clover Ditch, a tributary of Fountain Creek.

Settled sludge from the primary clarifiers was diverted to the Digester complex. Primary sludge pumps were housed in a Primary Sludge Pumping Building. Sludge collected from the secondary clarifiers was returned to the waste stream at Diversion Box 3875. Pumps for this sludge were housed in the basement of Laboratory and Control 3887.

A heated Primary Digester 3860 held the sludge for approximately one day until it was pumped to the Secondary Digester 3863, where it again sat for three to five days. Supernatant from the Secondary Digester was piped back to the waste stream at Diversion Box 3875 for reprocessing. The fully processed sludge from the Secondary Digester was piped to Sludge Beds 3864 and 3865 to dry. Digester Control Room 3862 sat between both digesters and contained sludge pumps and heating units for the digester.

As Camp Carson neared completion, plans to enlarge the camp by adding a training unit and a 3,000-man internment camp were announced. Subsequently, in 1943 the WWTP was enlarged and upgraded from a single-phase trickling filter plant to a two-phase trickling filter plant (Figure II-3). As initially constructed, the waste stream passed once through a zooglio mass at Trickling Filter 3884 or 3886. After the upgrade the waste stream passed through new Trickling Filters 3881 or 3883 before going through original Trickling Filters 3884 or 3886. This effectively doubled the aerobic filtration capacity of the plant. As part of the upgrade, the re-circulation line was relocated from 3885 to the new Filter Head Box 3882. The remaining treatment process remained unchanged.

In 1954 Camp Carson became a permanent installation and was renamed Fort Carson. Many deteriorated temporary buildings throughout the base were upgraded at this time. The WWTP was also showing signs of deterioration. Hastily constructed concrete walls and floors had settled and cracked, piping was failing, the electrical system was outdated and much of the complex's mechanical equipment was worn out or obsolete. Consequently, from 1961 to 1965, the complex underwent its first major overhaul. At this time the plant was simultaneously upgraded. New buildings were constructed, equipment was repaired or upgraded, and an electrical monitoring system was installed throughout the complex. This system allowed plant personnel to remotely monitor, record, and manipulate the plant's operations.

Included in the overhaul was construction of a new headworks. The new headworks replaced the former bar screen with a more sophisticated process where inorganic solids were removed from the influent stream at a grit collector, sent through a classifier, and loaded into a hopper within Grit Washer 3871. Remaining solids in the influent stream were sorted and shredded by a comminutor and returned to the influent stream. A second wave of upgrades during the late 1960s and early 1970s made the plant more efficient but did not significantly alter its process.

In the mid-1970s the Army began a program of revitalization aimed largely at increasing building and operational efficiency. As part of that effort, Fort Carson conducted a second major overhaul at the WWTP. The two-phase treatment process was upgraded to its present three-phase process (Figure II-4), which resulted in the addition of several steps to the treatment process. With the upgrade, the plant was able to process waste water well enough to allow its use as a non-potable water source for irrigation of the Camp's golf course.

In the plant's new third phase, a tertiary filtration complex filtered effluent from the secondary clarifiers through massive sand-filled tanks housed in a Tertiary Filter Building 3897. The thrice-filtered waste water could then be piped to an irrigation pump and well. Water used to periodically back-flush the sand media in the Tertiary Filter 3897 flowed to Backwash Holding Basin 3896 before being pumped to an Equalization Basin to be reprocessed. The pumps for this process are housed in a Backwash Return Pump Station adjacent to the Backwash Holding Basin.

Waste water not utilized for irrigation was metered, chlorinated at a Chlorine Injection Station, mixed at Chlorine Contact Chamber 3869, and, in another new step introduced at this time, de-chlorinated with the application of Sulfur Dioxide prior to release. The decision to add a de-

chlorination step to the treatment process was one made by Fort Carson plant management in an effort to increase the quality of the plant's effluent (Dan Golden, personal communication 1996).

At this time the recirculation system outlet was relocated from Trickling Filter Head Box 3882 upstream to Diversion Box 3875. This modification sent recirculated waste water through the primary clarifiers as well as the trickling filters and secondary clarifiers.

Construction of a flow equalization complex at this time did not change the plant's method of treatment but added yet another step to its treatment process. The complex processed influent and moderated irregular flow levels.

In 1988 the Army turned over management of the WWTP to the private sector. The plant is presently managed by Pacific Architects and Engineers Incorporated, Fort Carson Division.

The incinerator complex, constructed immediately adjacent to the WWTP, was unrelated in function to the plant. The incinerators were constructed from standard military plans. They burned waste such as sensitive military documents. At each building incoming waste was unloaded at the dock and fed to two furnaces through two large manholes in the charging room (main level) floor. The brick and iron furnaces on the lower level incinerated the waste. Exhaust gases traveled through a horizontal tunnel between the furnaces and chimney.

Incinerator 3850 still functions as an incinerator, though little waste is processed through the complex. The massive furnaces are in disrepair, and waste is today burned in a smaller metal furnace that sits on the charging room floor.

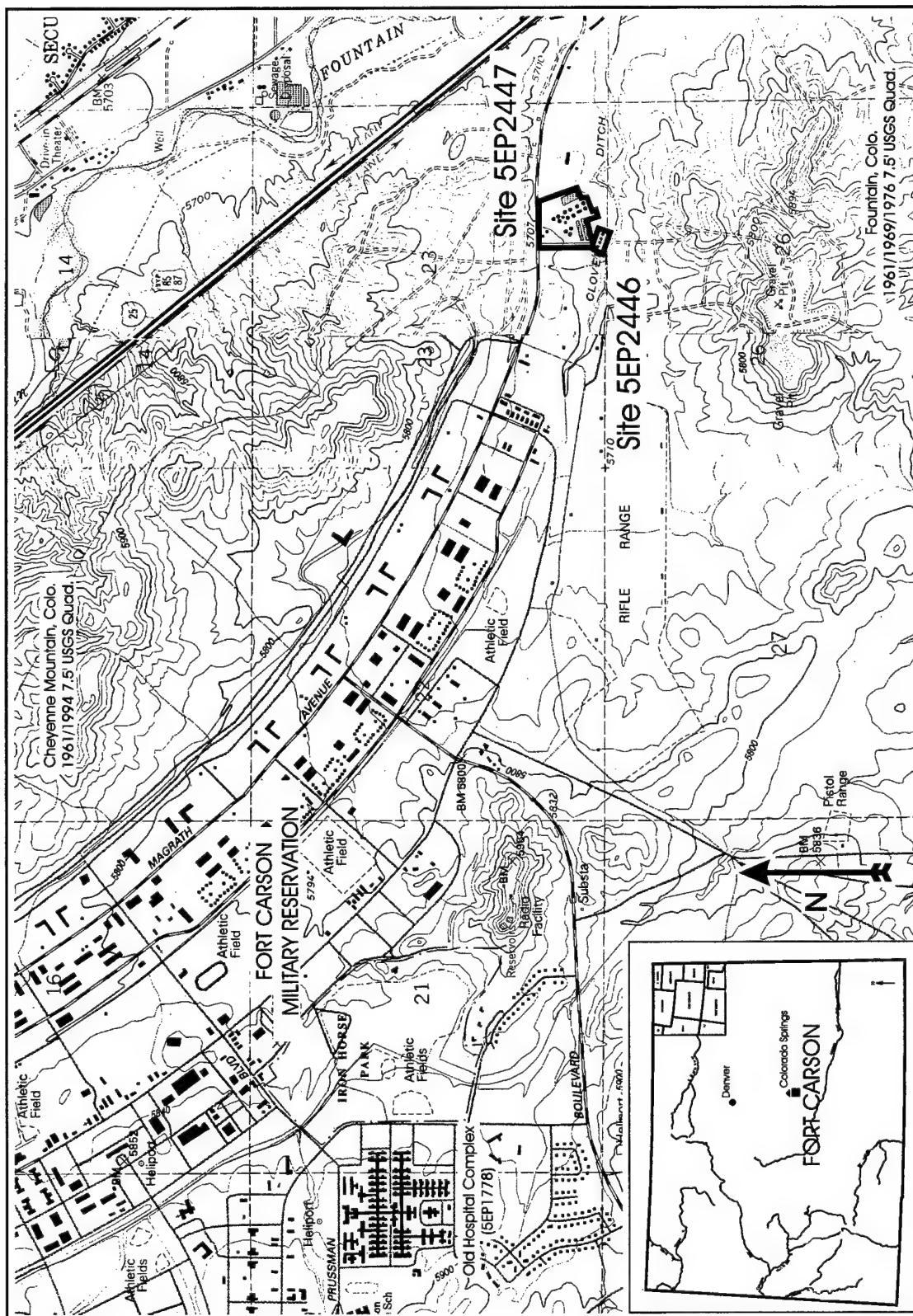
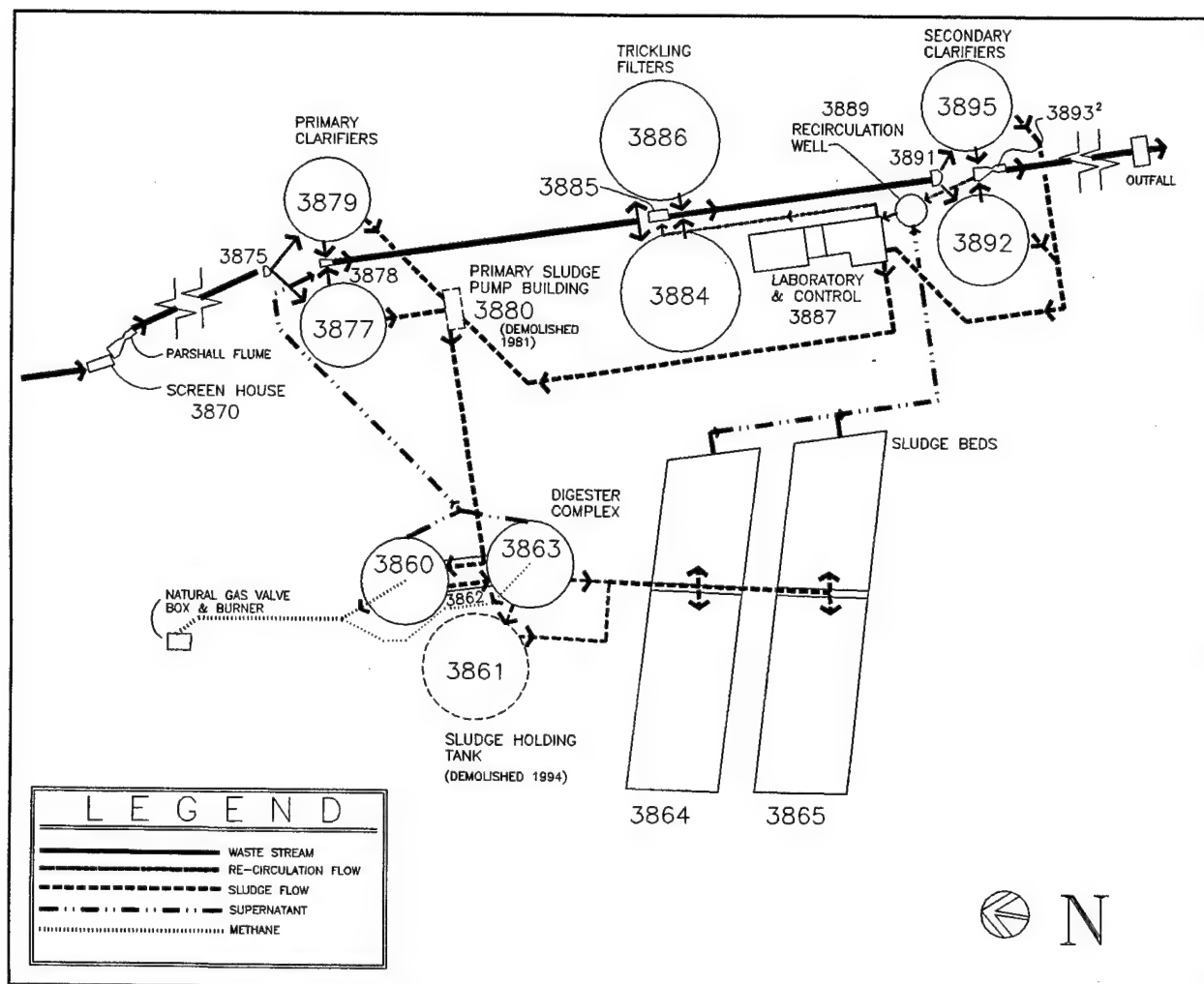


Figure II-1. Location Plan for Waste Water Treatment Plant and Incinerator Complex.



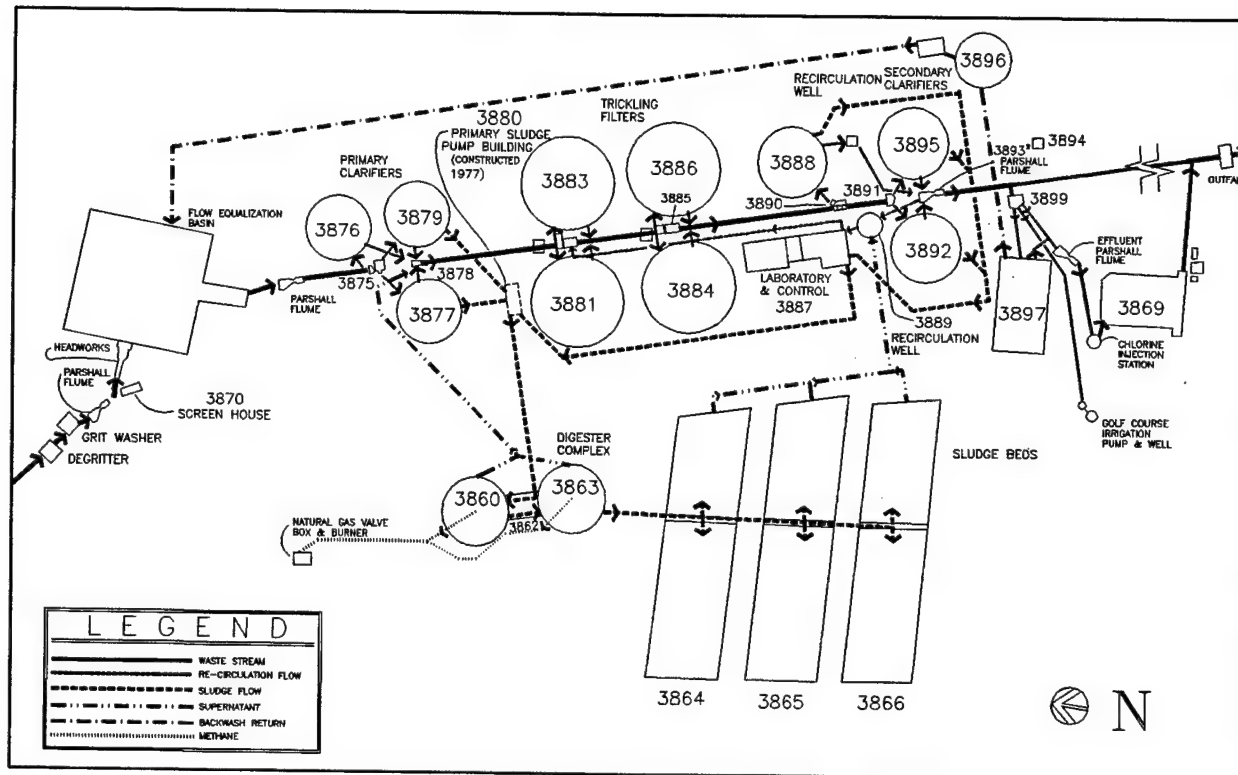


Figure II-4. Three-Phase Trickling Filter Plant Flow Diagram.

Modifications and Additions

This section describes in detail the physical changes that occurred as a result of the plant's evolution in treatment process. The Fort Carson Office of Real Property maintains a building record for most structures at the WWTP. This record includes estimated dates of completion for many buildings. These are augmented by "as-built" dates from construction documents (see Table II-1).

The 1943 expansion involved the construction of Trickling Filters 3881 and 3883, a third Primary Clarifier 3876, a third Secondary Clarifier 3888, one Sludge Holding Tank 3861, and one Sludge Bed 5222. Sludge Bed 5222 was abandoned later that same year. Diversion Boxes 3875, 3878, 3890, and 3891 were modified or enlarged to channel flow through the new clarifiers. Recirculated waste water was rerouted from Filter Head Box 3885 to the new Filter Head Box 3882 (Figure II-5).

The WWTP Screen House 3870 was rebuilt in 1957. The original wood frame walls and gable roof were replaced with concrete block walls and a flat, poured concrete roof. The new walls were constructed over the original foundation. One course of blocks near the roof line was laid sideways and provided ventilation. Original double-hung wood-frame windows were replaced with metal sash-type windows.

The plant's first upgrade in 1961-1965 resulted in many changes (Figure II-6). A security fence was constructed around the plant, and several new buildings and structures were completed by 1965. Electrical Power Building 3874 housed a central bank of circuit breakers for the WWTP. Grit Washer 3871 and Degritter 3872 separated, cleaned, and stored inorganic materials filtered from the waste water stream. A headworks consisting of a bar screen, shredding machine (Comminutor) and influent Parshall Flume was constructed at the northeast side of Screen House 3870. This new complex supplanted the functions of the original Screen House 3870 and its 1942-vintage influent Parshall Flume, though both were maintained as an emergency backup. The 1965-vintage Comminutor, bar screen, and Parshall flume, and the 1942-vintage influent Parshall flume at Screen House 3870 were replaced in 1985 with a new headworks constructed between Grit Washer 3871 and a new Flow Equalization Basin. This headworks also contains a bar screen, Comminutor, and Parshall Flume.

While construction of the new buildings commenced, modifications to many existing buildings were underway. At Screen House 3870 a rubber loading dock bumper was installed at the building's loading dock. Digester Control Room 3862 was upgraded with unspecified modifications to the electrical system. Additional undocumented changes to this building include the construction of a heat exchanger, present in 1961, that was not part of the original construction. Hot water lines, sludge pipes, and roof decking were replaced at the Primary and Secondary Digesters 3860 and 3863. The roof structures of both buildings were repainted. Sludge pipes, inlet boxes, and filtering media were replaced at Sludge Beds 3864 and 3865.

Modifications included replacing the mechanical equipment at Primary Clarifiers 3876, 3877, and 3879 and Secondary Clarifiers 3888, 3892, and 3895. Replacements included the center

columns, rake arms, and blades of the sweeps. Cracked concrete floors were repaired and regrouted where needed.

Flow control gates at Diversion Box 3878 were replaced. This building's grit structure was rehabilitated, and the building's concrete was patched and repaired. New filter exhaust fans and overload control sensors were installed at Trickling Filters 3881, 3883, 3884, and 3886. Filter exhaust fans at the Trickling Filters pulled air through the rock media and zooglio mass. This promoted growth of the mass and increased the trickling filter's efficiency. Overload control sensors signaled that the trickling filter was operating beyond its capacity. Plans proposing replacement of distributor assemblies and filter media at Trickling Filters 3884 and 3886 bear no "as-built" designation, and it is unknown if the work was carried out. Filter Head Boxes 3882 and 3885 were enlarged. Proposed replacement walkway platforms, ventilator units, gate valves, steel stairways, and filter influent/effluent gates for these buildings were probably installed at this time.

Laboratory and Control 3887, referred to in the 1942 completion report as the Chlorinator Laboratory Building, was extensively remodeled as part of the overhaul. Electrical wiring and entrance doors were replaced in the building's north wing. This wing was originally a large room used for storage of chlorine tanks. In 1961 the northwest corner of the room was partitioned off with concrete block walls. Into this new room was moved all chlorinator equipment, including chlorine tanks, regulators, and a scale. The remainder of the north wing's space was used to house a new waste flow foam suppression system and general storage areas. Building 3887's laboratory room on the first floor of the south wing was remodeled with the installation of new wainscoting, insulation, drywall, ceiling tiles, asphalt floor, and cabinets. Recirculation equipment including pumps, valves, and fittings housed in the lower level of the south wing, was replaced. The portion of the first floor of the south wing that formerly housed the chlorinator equipment was converted to a motor control room, housing control panels that allowed remote monitoring and operation of the plant's mechanical equipment. Filter exhaust fans were replaced and existing light fixtures were removed and replaced with shallow dome reflectors. Exposed conduits were removed or hidden. Room heaters and a new ventilation system were installed in the basement beneath the south wing. One of the building's recirculation pumps was replaced and piping for a new irrigation system was installed. The building exterior was also modified. A concrete retaining wall, likely the present one that surrounds the building's north side, was constructed. It was probably at this time that original wood double-hung windows were replaced with the present combination aluminum windows.

The external component of the foam suppression system consisted principally of a spray nozzle directed at the waste stream at Diversion Box/Parshall Flume 3893, formerly identified as 3894 on some original plans and drawings. Chlorine was also injected at this location.

In 1963 and 1964, alterations to Digester Control Room 3862 included the installation of equipment for a new methane gas recirculation system at Digesters 3860 and 3863. An existing methane gas safety system was upgraded, and sump pumps, recirculation pump motors, impellers, and piping were replaced. An existing basement stair was replaced with a metal ladder.

Plans dated 1961 called for replacement of sluice gates at Diversion Boxes 3875, 3890, and 3891. No "as-built" plans have been found, but this work was probably a part of the 1960s upgrade.

Handrails and light fixtures were installed at Primary and Secondary Clarifiers 3876, 3877, 3879, 3888, 3889, and 3892. Overload alarm systems at each of these were also updated with remote systems. Sludge piping at Clarifiers 3877, 3878, and 3879 was replaced.

The WWTP's second major overhaul began around 1975 and was completed in 1981 (Figures II-7 and II-8). As before, the overhaul resulted in some new construction as well as in general modifications to existing plant equipment and processes. Three new complexes were constructed during this overhaul. A flow equalization complex sat near the north end of the site. The tertiary complex and chlorination facility sat adjacent to each other near the south end of the plant.

Some additional construction was unrelated to the three complexes. Emergency Generator Building 3868 was constructed south of the sludge beds in 1977. Standby Generator Building 3873 was probably constructed at this time. This building stands near Screen House 3870.

Buildings constructed at the chlorination complex in 1977 included the Chlorine Building 3867, Chlorine Contact Chamber 3869, and Diversion Box 3894. Buildings associated with the new chlorination complex included an unnumbered De-Chlorination Building, Emergency Eyewash Station, and Sulfur Dioxide Tank Storage Building. The De-Chlorination Building contained equipment for injecting sulfur dioxide, stored at the Sulfur Dioxide Tank Storage Building, into the effluent stream at the point where it left the Chlorine Contact Chamber.

Less than one year after its completion, the Chlorine Contact Chamber's system of gates and pipes was renovated to exclude the injection of chlorine. This function was instead moved to a new Chlorine Injection Station northwest of the Chlorine Contact Chamber.

The tertiary complex was completed in about 1978. It initially consisted of several buildings, the largest of which, labeled as "Filter" on a 1977 site plan, sat immediately north of Chlorine Contact Chamber 3869. This building was enlarged soon after its completion to become the present Tertiary Filter Building 3897. Two smaller filter buildings, as well as a pump house, two small paint buildings, and a lagoon were demolished by 1981. Lagoons were sometimes used in place of drying beds. Site plans from the 1970s indicate that a sludge lagoon or holding pond briefly functioned at the WWTP, and was removed in the mid or late 1970s.

Diversion Box 3899 was constructed to distribute flow to the Outfall line, chlorination complex, tertiary complex, or the new Golf Course Irrigation Well that sat immediately south of the sludge beds.

The flow equalization complex was completed in 1981. It contained a headworks and Flow Equalization Basin. The headworks contained a comminutor, a barminutor and a Parshall Flume. These were constructed east of Building 3871. The new headworks replaced the Parshall flumes, comminutor and barminutor that surrounded Building 3870 and dated from 1942, 1961, and 1965. The Flow Equalization Basin and an accompanying Parshall Flume was constructed downstream of the headworks.

Primary Sludge Pump Building 3880 and Backwash Holding Basin 3896 were also completed in about 1981. The Primary Sludge Pump Building sat approximately 15' northwest of its wood frame predecessor. At that time the plant's eastern edge was moved approximately 100' east. A new fence defined the eastern edge of the expanded site, which brought the plant's area to approximately thirteen acres. A new entrance gate, parking lot, and Laboratory and Control 3900 were constructed in the newly accessioned area. The new building provided more space for crew facilities, laboratories, offices, and control rooms than was available at Laboratory and Control 3887.

The upgrade resulted in modifications to existing buildings and machinery. The Primary and Secondary Digesters 3860 and 3863 were upgraded with modifications to the heat exchanger units, and replacement of gas lines, gas meters, sludge pumps, sludge transfer lines, mixing pump platforms, electrical systems, flushing water systems, and various other mechanical components. Methane gas safety equipment, a sludge pump, and the boiler at Digester Control Room 3862 were also replaced. Rotary assemblies, distributor assemblies, and accessories were replaced at Trickling Filters 3883, 3884, and 3886. The replacement assemblies required modification of the center piers. Filter Head Boxes 3882 and 3885 received replacement gate valves and sluice gates.

In 1977 new magnetic flow meters were installed in the recirculating system housed in the basement of Laboratory and Control 3887. Concrete walls and floors in Diversion Box 3890 and Diversion Box/Parshall Flume 3893 were caulked, sealed, and repaired. In addition, pipes, stop gates, and sluice gates were reconditioned, repaired, or replaced, and the flume channel was narrowed. Two new diversion boxes and sluice gates were installed at Diversion Box 3875. The new boxes were constructed immediately downstream (south) of the original construction. Replacement lines and fittings were installed at Diversion Box 3878. A new influent line and sluice gates were constructed between Diversion Box 3890 and Recirculation Well 3889. The six-sided original portion of Diversion Box 3891 was demolished. There was construction of four new boxes on the building's downstream side. These boxes probably collected influent from the secondary clarifiers. The walls of the building's flume were narrowed with the addition of a new concrete and fiberglass liner. The mechanical Classifier and Separator housed in Grit Washer 3871 were replaced.

Work at the Digester Control Room 3862 included the replacement of the hot water recirculation pump motor and impellers, mixing pump motors, heat exchanger, water boiler, and exhaust fan. The building's electrical wiring was also replaced.

As part of this overhaul, much of the complex's equipment was replaced. Modifications to existing buildings included replacement distributor bearings and other accessories at Trickling Filters 3883, 3884, and 3886, and replacement gate valves and sluice gates at Filter Head Boxes 3882 and 3885.

Primary Clarifiers 3876 and 3877 and Secondary Clarifiers 3892 and 3895 were overhauled. This included replacement of sludge removal equipment, scum troughs, scum baffles, and effluent weirs, and the replacement of floor grout. The mechanical equipment at Primary Clarifier 3879 was left intact, but was repaired and repainted. New pipe sleeves and influent/effluent lines were

installed at Diversion Boxes 3875 and 3878. A third collection/distribution box was constructed at Diversion Box 3778.

Finally, the aero-filter distribution system of Trickling Filter 3881 was replaced. This included replacement of the rock media, rotary distributors, and exhaust fans. In addition, the building's concrete walls were patched. Influent/effluent lines, fittings, and exhaust fans were replaced at Filter Head Boxes 3882 and 3885.

The plant underwent a minor upgrade in 1984 and 1985. New steel swinging filter head box cranes constructed in 1984 at Filter Head Boxes 3882 and 3885 facilitated removal of large metal filter screens. Secondary sludge and recirculating pumps and motors, flow meters, and a manual set point controller at Laboratory and Control 3887 were replaced. Concrete ramps, bed dividers, and inlet sluice gates were constructed at Sludge Beds 3864 and 3865. These improvements replaced the original sand and gravel floors, and allowed each bed to be compartmentalized into four separate beds rather than the previous two. At this time Sludge Bed 3866 was constructed immediately south of 3865. It was constructed with a concrete floor similar in design to the new floors of the existing sludge beds. The small portion of Sludge Holding Tank 3861 that sat above grade was buried in 1992. This tank was removed in 1994.

During this time, extensive maintenance efforts were focused upon the digester complex. The roofing at Primary Digester 3860 was replaced and a replacement mixing pump was installed. Secondary Digester 3862 also received a replacement mixing pump and motor, as well as a replacement recirculation pump motor, impellers, and piping. Much of this equipment is located in Digester Control Room 3862. At about this time the Digester Control Room's hot water boiler was replaced.

In 1993 a new effluent Parshall Flume was constructed near the Chlorine Contact Tank. This flume meters plant effluent entering the chlorination phase.

Plant management and maintenance staff routinely replace worn or broken mechanical parts. Little of this work is documented in plant records or submitted to the Army Corps of Engineers for plan revision.

Several small unnumbered structures are not documented in Real Property Records, nor do they appear on building or site plans. Their construction dates can be assumed to match the dates of construction for known related buildings.

The military Category Codes for building usage were changed to 'facilities engineering' for each of the three incinerators in 1974. These codes are now obsolete and little is known about the buildings' modifications (Table II-2). Incinerator 3850 still functions as an incinerator, though a modern electric gas-fired incinerator on the charging floor has replaced the function of the original brick incinerator ovens, which are now partially dismantled. A modern overhead garage door was installed at the north loading dock door. This building was upgraded in 1991 with the installation of an exhaust fan and new electrical wiring. A modern concrete ramp provides vehicular access to the original loading dock.

Incinerator 3851 was converted to facilities engineering office space in 1974. Incinerator 3852 became a Military Affiliate Radio System Station transmitter. The extent of alterations for this use are unknown. This building was converted to a preventative maintenance shop in 1991.

The conversions of Incinerators 3851 and 3852 involved the removal of all incinerator ovens. The building interiors were finished with drywall, flooring, dropped ceilings, divider walls, and paint. Lavatories and kitchenettes were installed. North-facing loading dock doors were replaced with concrete masonry unit block walls, each containing one window and one pedestrian door. The original sliding door on each of the buildings' south sides was replaced with modern swinging pedestrian doors. The buildings' exterior wall surfaces, original windows, roofing, and chimneys were left intact. Both docks have been modified since their construction with the installation of stairs. The dock at 3852 also has a modern pipe railing at its edge. A small concrete grease pit sits near the northeast corner of 3850.

Incinerator Lavatory 3853 originally housed a shower and lavatory for incinerator workers. The building later housed a generator before being demolished in 1995 (Figure II-9). All that remains today is a concrete floor and foundation.

Table II-1. Summary of Additions & Modifications to Fort Carson WWTP - 5EP2447

Building Name and Number	Year Constructed	Year Modified	Description
3860- Primary Digester	1942	1975 1977 1984/1985	Modifications in 1975 to the heat exchanger unit, gas lines, gas meter, sludge pump, sludge transfer line, mixing pump platform, electrical system, and various other mechanical parts. Modifications in 1977 to the flushing water system. Roofing was replaced and a replacement mixing pump was installed in 1984/1985.
3861- Sludge Holding Tank	1943	1992 1994	Small portion of tank that sat above grade was buried in 1992. Demolished in 1994.
3862- Digester Control Room	1942	1961 1963 1964 1977 1984/1985	Modifications in 1961 to the electrical system, as well as the replacement of water lines, sludge piping, roof decking, and painting of structural steel. Modifications in 1963 included the installation of a new gas recirculation system, and a modification of gas safety equipment. Modifications in 1964 consisted of the replacement of existing pump motors and the addition of handrails and ladders in the building. Modifications in 1977 consisted of the replacement of pump motors, a heat exchanger, a water boiler, an exhaust fan, and electrical wiring. A mixing pump and motor and a recirculation pump motor, impellers and piping were replaced in 1984/1985. The Digester Control Room's hot water boiler was replaced at this time.
3863- Secondary Digester	1942	1975 1977	Modifications in 1975 to the heat exchanger unit, gas lines, gas meter, sludge pump, sludge transfer line, mixing pump platform, electrical system, and various other mechanical parts. Modifications in 1977 to the flushing water system.

3864- Sludge Bed	1942	1961 1984	Modifications in 1961 consisted of the replacement of piping, inlet boxes, bed sectionalizing, replacement of sand, and repair of existing support structure. Concrete ramps, bed dividers and inlet sluice gates were constructed in 1984, replacing the original sand and gravel floors. This allowed the bed to be compartmentalized into four separate beds rather than the previous two. Also in 1984 was the installation of push-on joints to PVC piping.
3865- Sludge Bed	1942	1961 1984	Modifications in 1961 consisted of the replacement of piping, inlet boxes, bed sectionalizing, replacement of sand, and repair of existing support structure. Concrete ramps, bed dividers and inlet sluice gates were constructed in 1984, replacing the original sand and gravel floors. This allowed the bed to be compartmentalized into four separate beds rather than the previous two. Also in 1984 was the installation of push-on joints to PVC piping.
3866- Sludge Bed	1984		No modifications recorded.
3867- Chlorine Building	1977		No modifications recorded.
3868- Emergency Generator Bldg	1977		No modifications recorded.
3869- Chlorine Contact Chamber	1977		No modifications recorded.

3870- Screen House	1942	1957 1965	Building was rebuilt in 1957. Renovations in 1965 included the installment of a new parshall flume, shredder, and other equipment.
3871- Grit Washer Bldg	probably 1957 when 3870 rebuilt	1961 1963 1964 1977	New equipment was installed in 1961, including a new pressure switch and pump motor starter. Modifications in 1963 consisted of wall reinforcement and revision to the sump system. Modifications in 1964 included the installment of steel grating for the grit washer. The mechanical classifier and separator replaced in 1977.
3872- Degritter	probably 1957 when 3870 rebuilt	1961 1964 1984	Degritter machinery was replaced in 1961. Grating was added, ventilation and control wiring were replaced, and a new apex valve was installed in 1964. Renovations in 1984 consisted of replacing the entire mechanism (motor, drive unit, shaft, arms, and blades), the mechanism support, handrails, deflectors, grout, grit piping, and providing a waste container storage area along the north side of the degritter.
3873- Standby Generator Bldg.	1980/1981		No modification recorded.
3874- Electrical Power Bldg	1965	1967 1984	Modifications in 1967 consisted of cathodic protection. The electrical system was upgraded in 1984.
3875- Distribution Box	1942	1943 1975 1977	Modified to channel flow through new Primary Clarifier 3876 in 1943. Modifications in 1975 consisted of repair and replacement of scum piping. In 1977 new influent/effluent lines and pipe sleeves were installed and two new diversion boxes and sluice gates were installed at 3875 immediately south of the original construction.

3876- Primary Clarifier	1943	1961 1964 1971 1977	<p>Modifications in 1961 consisted of the replacement of exterior mechanical equipment (center column, rake arms, blades, etc.), and the patching of the floor. Modifications in 1964 consisted of the replacement of the alarm horn with a VG-3 fixture, and the addition of handrails. In 1971, the handrails, walkways, and electrical services were reinstalled, all metal was painted, and the scum troughs, scum baffle, effluent wier, and floor grout were replaced. Modifications in 1977 consisted of replacing the scum baffles, scum troughs, effluent weirs, sludge removal equipment, and floor grout.</p>
3877-Primary Clarifier	1942	1961 1964 1971 1977	<p>Modifications in 1961 consisted of the replacement of exterior mechanical equipment (center column, rake arms, blades, etc.), and the patching of the floor. Modifications in 1964 consisted of the replacement of the alarm horn with a VG-3 fixture, and the addition of handrails. In 1971, the handrails, walkways, and electrical services were reinstalled, all metal was painted, and the scum troughs, scum baffle, effluent wier, and floor grout were replaced. Modifications in 1977 consisted of replacing the scum baffles, scum troughs, effluent weirs, sludge removal equipment, and floor grout.</p>
3878- Distribution Box	1942	1943 1961 1977	<p>Modified in 1943 to channel flow from new Primary Clarifier 3876. Modifications in 1961 consisted of replacement of flow control gates, rehabilitating the grit structure, and repairing the concrete as required. Modifications in 1977 consisted of replacing two 30" lines, installing new 3" steel pipe sleeves through the box, and constructing a third box.</p>

3879- Primary Clarifiers	1942	1961 1964 1971 1977	Modifications in 1961 consisted of the replacement of exterior mechanical equipment (center column, rake arms, blades, etc.), and the patching of the floor. Modifications in 1964 consisted of the replacement of the alarm horn with a VG-3 fixture, and the addition of handrails. In 1971, the handrails, walkways, and electrical services were reinstalled, all metal was painted, and the scum troughs, scum baffle, effluent wiers, and floor grout were replaced. Modifications in 1977 consisted of replacing the scum baffles, and adjusting the wier plates.
3880- Sludge Pump Bldg	1942	1970 1977 1981	Modifications in 1970 consisted of the removal and reinstallation of the sludge pumps. Modifications in 1977 consisted of the installation of handrails wall stiffeners, and a new electrical system, as well as the removal and reinstallation of the recirculation pumps and sludge pumps. Original 3880 demolished in 1981 and a new sludge pump building, also 3880, constructed to the northwest.
3881- Trickling Filter	1943	1961 1971 1977	Modifications in 1961 consisted of the installment of a new filter exhaust fan. In 1971, the center pier was modified, and a new rotary assembly was installed, and all the metal was painted. Modifications in 1977 consisted of the removal and replacement of the aerofilter distribution system, as well as all the rock media in the filter. A new rotary distributor was installed, and holes in the concrete walls were plugged.

3882- Filter Head Box	1943	1961 1975 1977 1984	Modifications in 1961 consisted of the removal and reinstallation of the filter media in the filter, replacing the damaged filter tile with new filter tile, repairing all damaged concrete, and installing a new distributor assembly. New platforms, ventilator units, gate valves, a steel stairway, and a new filter effluent gate were also installed. Modifications in 1975 consisted of reinstalling gate valves, sluice gates, center collum bearings and accessories, mercury seals, cutting blades, and meter flow recorder. Gate valves, sluice gates, and influent/effluent lines, fittings and exhaust fans replaced in 1977. Large metal filter screens removed and a steel swinging filter head box crane constructed in 1984.
3883- Trickling Filter	1943	1961 1971 1977	Modifications in 1961 consisted of the installment of a new filter exhaust fan. In 1971, the center pier was modified, and a new rotary assembly was installed, and all the metal was painted. Modifications in 1977 consisted of the removal and replacement of the aerofilter distribution system, as well as all the rock media of the filter. A new rotary distributor was installed, and holes in the concrete walls were plugged.
3884- Trickling Filter	1942	1961 1971 1977	Modifications in 1961 consisted of the installation of a new filter exhaust fan. In 1971, the center pier was modified, and a new rotary assembly was installed, and all the metal was painted. Modifications in 1977 consisted of the removal and replacement of the aerofilter distribution system, as well as all the rock media of the filter. A new rotary distributor was installed, and holes in the concrete walls were plugged.

3885- Filter Head Box	1942	1943 1961 1975 1977 1984	<p>Recirculated waste water re-routed to new Filter Head Box 2882 in 1943. Modifications in 1961 consisted of the removal and reinstallation of the filter media in the filter, replacing the damaged filter tile with new filter tile, repairing all damaged concrete, and installing a new distributor assembly. New platforms, ventilator units, gate valves, a steel stairway, and a new filter effluent gate were also installed. Modifications in 1975 consisted of reinstalling gate valves, sluice gates, center column bearings and accessories, mercury seals, cutting blades, and a meter flow recorder. Gate valves, sluice gates, and influent/effluent lines, fittings and exhaust fans replaced in 1977. Large metal filter screens removed and a steel swinging filter head box crane constructed in 1984.</p>
3886- Trickling Filter	1942	1961 1971 1977	<p>Modifications in 1961 consisted of the installation of a new filter exhaust fan. In 1971, the center pier was modified, and a new rotary assembly was installed, and all the metal was painted. Modifications in 1977 consisted of the removal and replacement of the aerofilter distribution system, as well as all the rock media of the filter. A new rotary distributor was installed, and holes in the concrete walls were plugged.</p>

3887- Laboratory Bldg	1942	1961 1963 1973 1977 1984	<p>Modifications in 1961 consisted of the renovation of the electrical system, installation of new doors and a new scale, the building of a concrete wall, removing wainscoting, adding insulation, installing drywall and ceiling tiles, installing a new asphalt floor, installing new cabinets, replacing the 2 recirculation pumps, valves, fittings, and chlorination equipment. Modifications in 1963 consisted of replacing the filter exhaust fans, removing the existing fixtures and replacing them with shallow dome reflectors, and removing all weatherheads for the yard lights, exhaust fans, and exposed conduits. Also included was the installation of heaters and piping, the construction of a new chlorination room, the installation of a ventilation system, utilities piping, and piping for the irrigation system. Modifications in 1973 consisted of replacing the pump motor, liquid level controller, and control cabinet. In 1977 new magnetic flow meters were installed in the re-circulating system housed in the basement of Laboratory and Control 3887. Modifications in 1984 consisted of the removal and installation of existing pumps and motors, the installation of a new flow meter, and the installation of a new manual set point controller.</p>
3888- Secondary Clarifier	1943	1961 1964 1971 1977	<p>Modifications in 1961 consisted of the replacement of all exterior mechanical equipment (central column, rake arms, blades, etc.) and the patching of the floor. Modifications in 1964 consisted of the replacement of the alarm horn with a VG-3 fixture, and the addition of handrails. In 1971, the handrails, walkways, and electrical services were reinstalled, all metal was painted, and the scum troughs, scum baffle, and effluent wiers, and floor grout were replaced. Modifications in 1977 consisted of replacing the scum baffles and adjusting the wier plates.</p>
3889- Recirculation Well	1942	1977	<p>Modifications in 1977 consisted of the installation of the irrigation pump station, and new caulked pipes. A new influent line and sluice gates were constructed between 3889 and 3890.</p>

3890- Distribution Box	1943	1975 1977	Modifications in 1975 consisted of removing and reinstalling piping, stop gates, and sluice gates. Repairs would also be made to leaks in the existing joints. Modifications in 1977 consisted of removing and reinstalling sluice gates, a slide gate, and a handrail. Surfaces were to be smoothed by grouting, and caulking was to be inserted between the walls.
3891- Distribution Box	1942	1943 1977	Modified to channel flow from the new Secondary Clarifier 3888 in 1943. The 6-sided original portion of 3891 demolished in 1977.
3892- Secondary Clarifier	1942	1961 1964 1971 1977	Modifications in 1961 consisted of the replacement of all exterior mechanical equipment (center column, rake arms, blades, etc.) and the patching of the floor. Modifications in 1964 consisted of the replacement of the alarm horn with a VG-3 fixture, and the addition of handrails. In 1971, the handrails, walkways, and electrical services were reinstalled, all metal was painted, and the scum troughs, scum baffles, and effluent weirs, and floor grout were replaced. Modifications in 1977 consisted of replacing the scum baffles, scum troughs, sludge removal equipment, effluent weirs, and floor grout.
3893- Distribution Box/Parshall Flume	1942	1975 1977	Modifications in 1975 consisted of installing concrete plugs, grouting, and providing corner bars. In 1977, concrete walls and floors were caulked, sealed and repaired. Pipes, stop gates and sluice gates were re-conditioned, repaired or replaced.
3894- Distribution Box	1977		No modifications recorded.

3895-Secondary Clarifier	1942	1961 1964 1971 1977	Modifications in 1961 consisted of the replacement of all exterior mechanical equipment (center column, rake arms, blades, etc.) and the patching of the floor. Modifications in 1964 consisted of the replacement of the alarm horn with a VG-3 fixture, and the addition of handrails. In 1971, the handrails, walkways, and electrical services were reinstalled, all metal was painted, and the scum troughs, scum baffles, effluent wiers, and floor grout were replaced. Modifications in 1977 consisted of replacing the scum baffles, scum troughs, sludge removal equipment, effluent weirs, and floor grout.
3896-Backwash Holding Basin	1981		No modification recorded.
3897-Tertiary Filter Bldg	1977		No modification recorded.
3899-Distribution Box	1977		No modification recorded.
3900- New Administration Bldg.	1981	1984	Modifications in 1984 consisted of the addition of handicap parking to the north of the bldg, the addition of downspouts, heads, and splash blocks, and the installation of a new electrical system and control panels.
5222-Sludge Bed	1943		Constructed and abandoned in 1943.

Table II-2. Summary of Additions & Modifications to Fort Carson Incinerators - 5EP2446

Building Name and Number	Year Constructed	Year Modified	Description
3850- Incinerator	1942	unknown date 1991	A modern electric gas-fired incinerator was installed on the charging floor to replace the original brick incinerator ovens (now partially dismantled) at some unknown date. In addition, a modern overhead garage door was installed at the north loading dock door and a grease pit was installed near the northeast corner of the building. A modern concrete ramp provides vehicular access to the original loading dock. An exhaust fan and new electrical wiring installed in 1991.
3851- Incinerator	1942	1974	Converted to facilities engineering office space in 1974. Incinerator ovens removed and building interior finished with drywall, flooring, a dropped ceiling, divider walls, and paint. A lavatory and kitchenette were installed. The north-facing loading dock doors were replaced with CMU block walls and contained a window and a pedestrian door. Original sliding door on the south side was replaced with a modern swinging pedestrian door. Dock was modified with the installation of stairs.
3852- Incinerator	1942	unknown date 1991	Building became a Military Affiliate Radio System Station transmitter at an unknown date. Incinerator ovens removed and building interior finished with drywall, flooring, a dropped ceiling, divider walls, and paint. A lavatory and kitchenette were installed. The north-facing loading dock doors were replaced with CMU block walls and contained a window and a pedestrian door. Original sliding door on the south side was replaced with a modern swinging pedestrian door. Dock was modified with the installation of stairs and a modern pipe railing at its edge. Building converted to a preventative maintenance shop in 1991.
3853- Incinerator Lavatory	1942	unknown date 1995	Original shower and lavatory for incinerator workers replaced by a generator at an unknown date. Building demolished in 1995. Concrete floor and foundation remain.

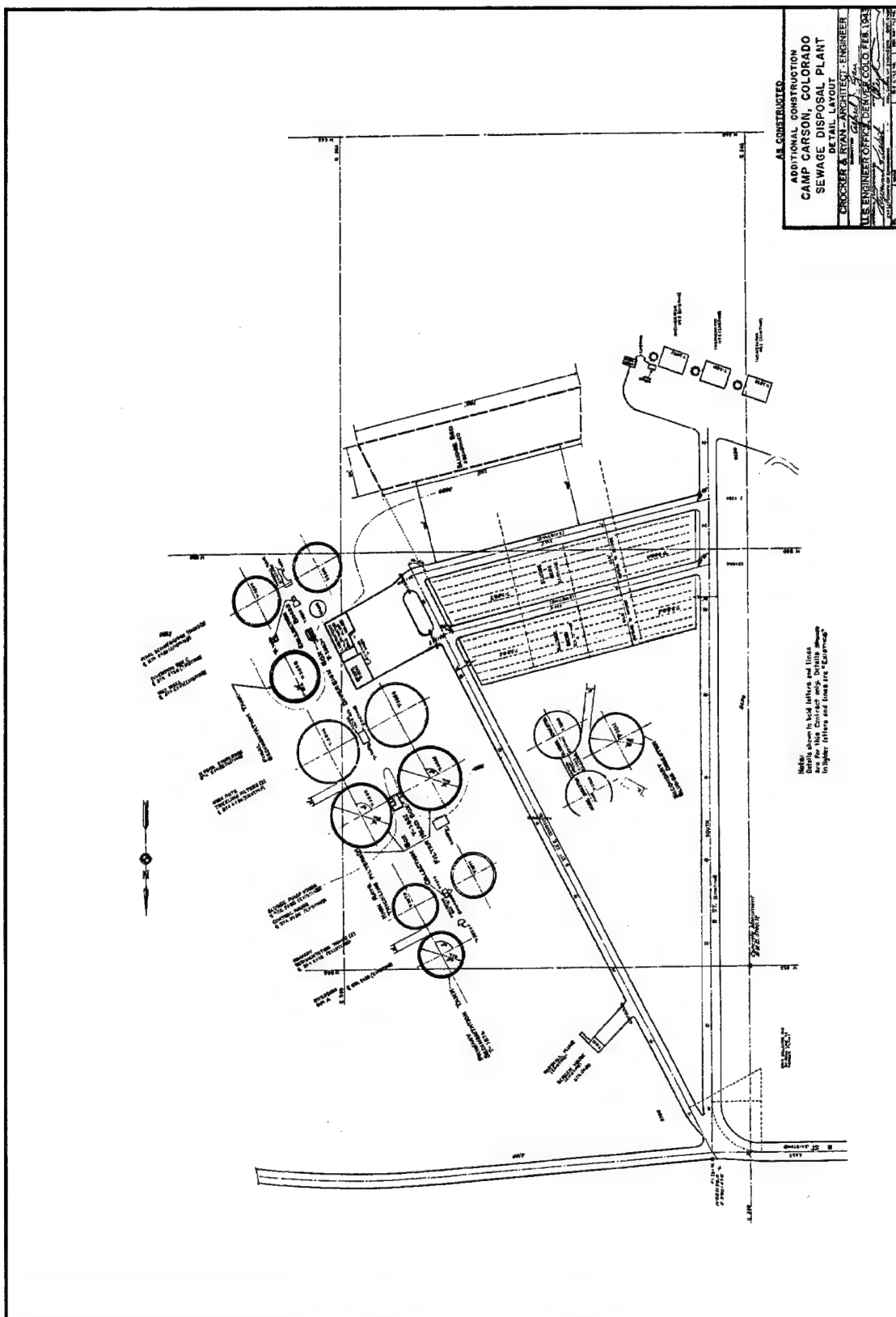


Figure II-5. 1943 Site Plan. Detail Layout for Additional Construction at Camp Carson Sewage Disposal Plant. Plan CCA-2-1. Note original construction in light lines, 1943 additions in dark.



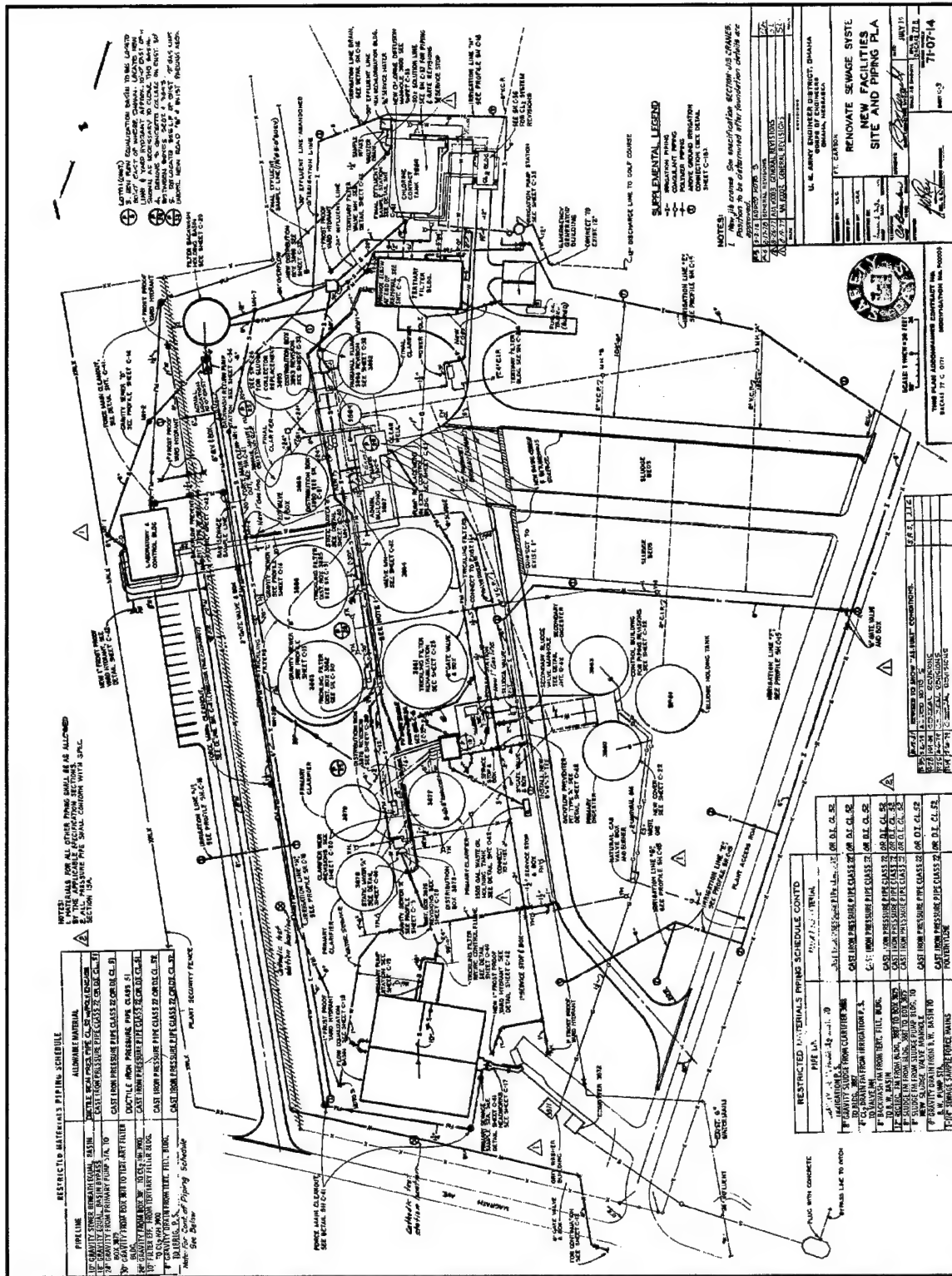


Figure II-7. 1978 Site Plan. New Facilities - Site and Piping Plan. Plan 71-07-14, Sheet C-3.

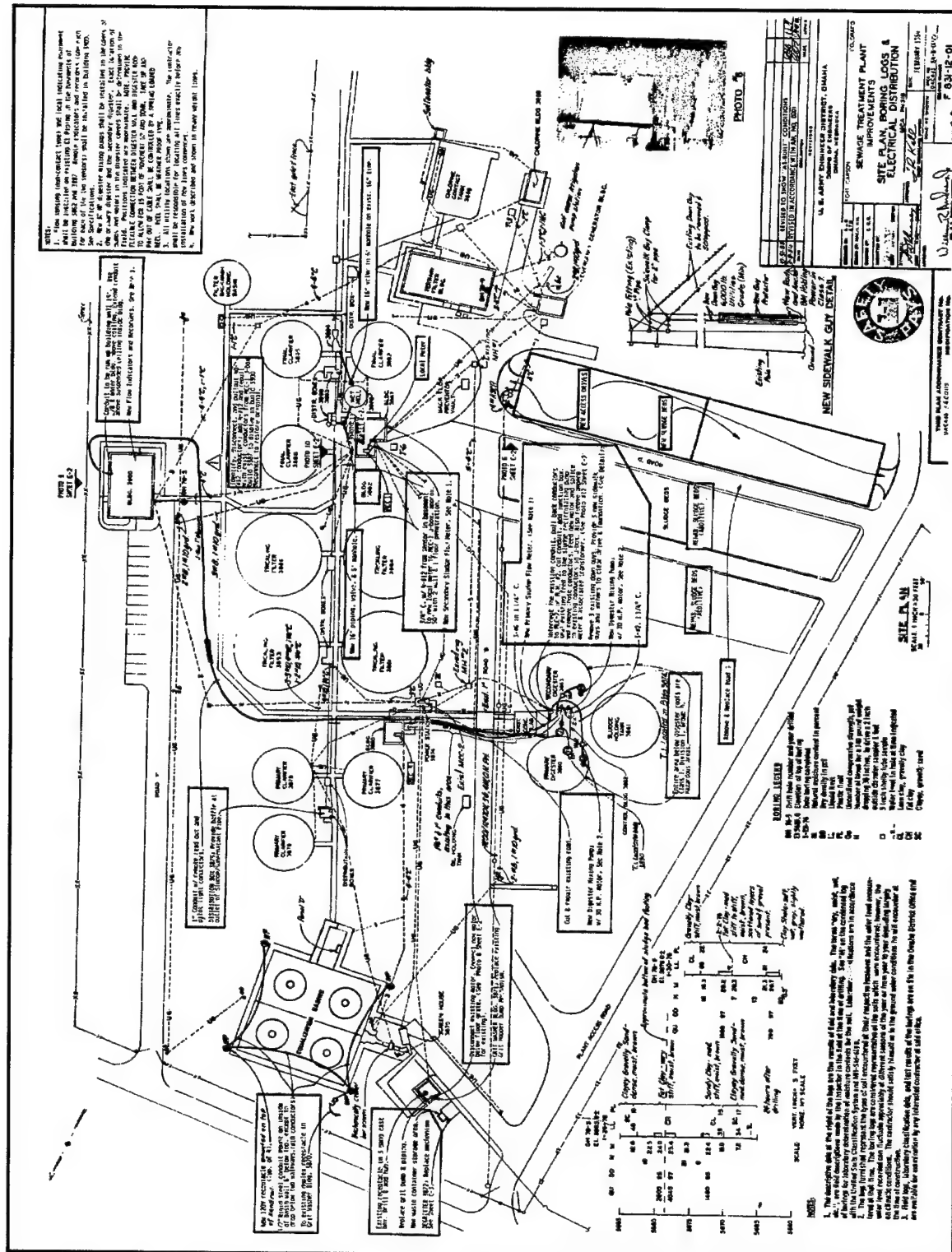


Figure II-8. 1985 Site Plan. Sewage Treatment Plant Improvements - Site Plan, Boring Logs, and Electrical Distribution. Plan F 831-12-01, Sheet C-2.

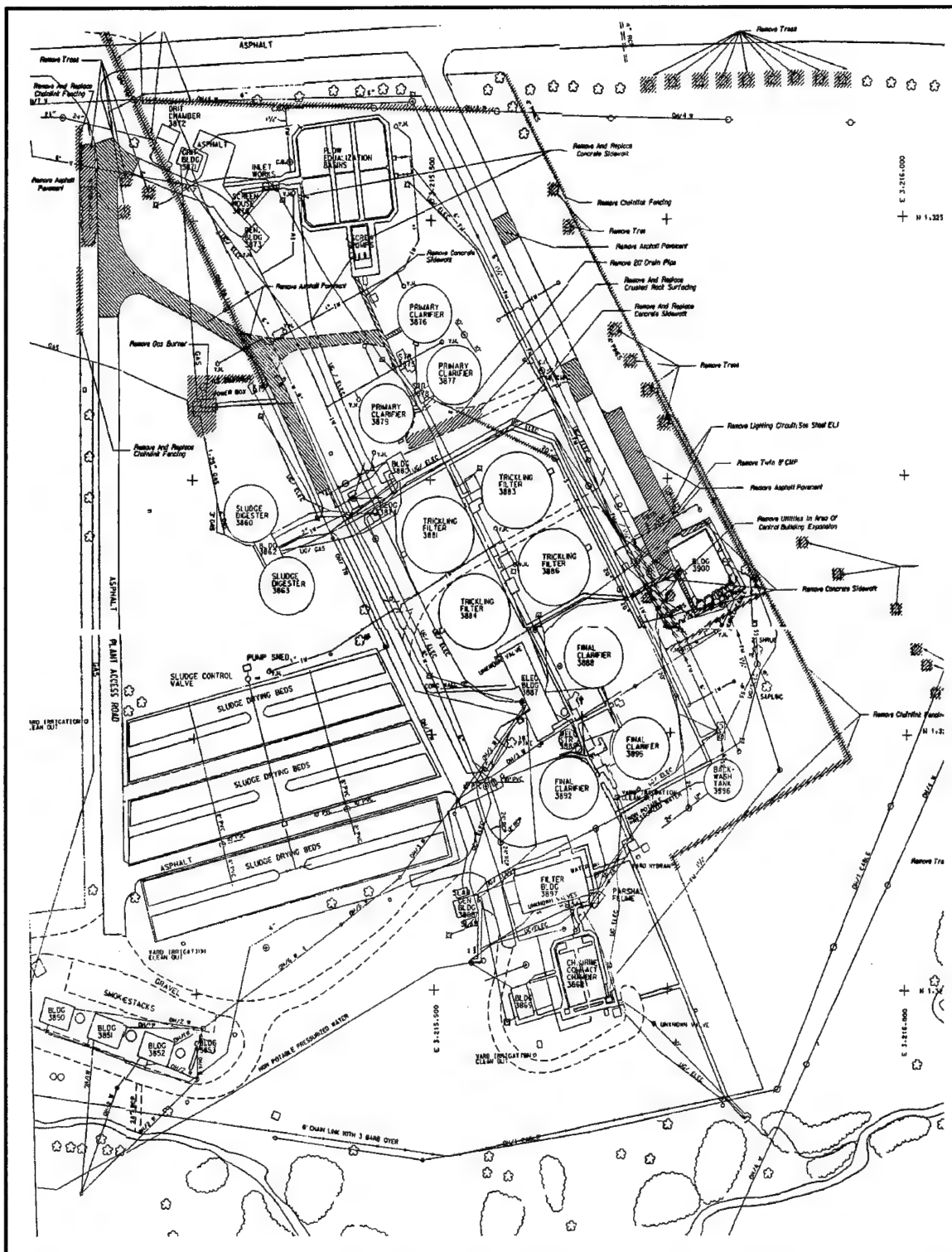


Figure II-9. 1995 Site Plan. Removal Plan - Waste Water Treatment Plant (WWTP) Upgrade. Plan 871-75-05, Sheets P2.1 and P2.2, Areas A and B.

Architectural Descriptions

The WWTP is accessed by one of two entrances off of Magrath Avenue. These lead to three north-south roads that parallel the east and west edges of the site and bisect it. Smaller east-west roads provide vehicular access to many of the buildings. Utility and light poles are situated throughout the complex. The plant is landscaped with a well-manicured bluegrass lawn and single rows of regularly spaced evergreen trees bordering the north, east, and west site edges. Additional evergreen trees appear at random throughout the complex. Small ornamental shrubs surround Laboratory and Control 3900. The south edge of the site is defined by Clover Ditch and contains grasses, shrubs, and trees in a natural pattern.

The Waste Water Treatment Plant and Incinerator Complex consist of 32 associated contributing and 33 associated non-contributing buildings (Figure II-10). As a whole, the architecture at the Waste Water Treatment Plant is characterized by utility, functionality, and efficiency. Buildings or structures that are considered contributing at the Plant are primarily those constructed in 1942 or 1943 during the initial phases of construction, but as late as 1957. Non-contributing buildings are those primarily constructed in the 1960s, 1970s, and 1980s.

At this site, when modifications were made to one type of structure, they were generally made to all similar structures at the same time. Because of this, there does not seem to be a "best remaining" structure of any type. Structures at the WWTP seem to have been upgraded as a group whenever the machinery needed repair or replacement. This section will discuss these structures in detail.

Contributing Buildings at 5EP2447

Screen House 3870 was originally constructed in 1942 and rebuilt in 1957 (Figures II-16, II-42, II-43, and II-44). The purpose of this building was to remove inorganic material, and this was the first structure the influent entered. This rectangular building has walls constructed of 10 courses of concrete masonry units, one course of 3-1/2" block with ventilation holes in the blocks, and two more courses of concrete masonry units. The structure measures 18' 2" by 12'. The roof of 3870 is of poured concrete and is set up with 12" wood forms 6" thick. The flow pipe runs along the north side. There is an influent hole on the west wall. A bypass runs east to the comminutor. The structure has one large (76" by 4' 4") window centered on each of the east and west sides. Each window has 16 lights (4 over 4) in steel muntins and frames. Rough openings are grouted shut. There is also a 24" forced exhaust fan on the north side of 3870. There is one sliding plywood exterior braced door centered on the south side with track hardware and a concrete sill. The structure has one 4' by 8' concrete stoop cantilevered with concrete supports from the foundation. There are three steps to the west. The concrete floor is about 3' above grade. A 2" metal grate in the sewage channel filters raw sewage, and the interior has one manhole, one 6' square hole, and one round threaded hole, all on the east side. A metal pipe railing surrounds the sewage channel. This structure was originally designed as a seining room but is now used for oil storage. Building 3870 has a new door and a new exhaust fan, and patterns in the floor suggest that some mechanical equipment is missing. A small 3' stoop at the foundation possibly indicates the presence of an original door on the north.

Diversion (or Distribution) Boxes 3875, 3878, 3890, 3891, and 3893 are all contributing structures (Figures II-17 and II-68). The diversion boxes collected the flow at numerous points in the process, and divided it and directed it to other structures. Diversion Box 3875 is an irregular-shaped structure (Diversion Box Type A) with poured-concrete walls extending to 1' above grade (Figures II-18 and II-45). The wall edges are chamfered. A concrete walkway runs over the center of the unit. This diversion box appears to have been built in two or three phases, as is evident in the wall structure and the various styles of pipe railing surrounding the structure. The northernmost section of 3875 is original and has railings that consist of welded 2½"-diameter pipes set in round bases. The southernmost section was a later addition and consists of welded 2"-diameter pipe railings bolted down with square plates. The gate equipment is from ARMCO. The grate to the north of 3875 is not original and is 4" deep. This collects grit and provides a clean working area for personnel.

Diversion Box 3878 is rectangular and is centered between the primary clarifiers (Figures II-20 and II-51). It is constructed of poured concrete with chamfered corners and measures 14' 10" by 4' 11". The box is divided into three compartments. The center and south sections have 8" walls, while the north section has 6" walls. This suggests that the box was probably constructed in three phases, with the center section first, the south section second, and the north section third. The center box has 2½" pipe railings with round bases, and the north box has 2" railings set directly in concrete. The railings have been removed from the south box, and two screw valves have been replaced.

Diversion Box 3890 (Diversion Box Type B) has 8" thick smooth-poured concrete walls with chamfered corners (Figures II-23 and II-71). This box has an irregular shape and feeds all three secondary clarifiers. The box has 2"-diameter metal pipe railings set directly in concrete. The oblong north-facing wing of 3890 is not original. Its railings are bolted with square metal plates to the wall lip. A seam separates the two sections of 3890.

The walls of Diversion Box 3891 (Diversion Box Type C) are 8"-thick smooth-poured concrete with chamfered lips and rise to 3' above grade (Figures II-29 and II-72). The box has an irregular footprint and has 2"-diameter welded pipe railings on square metal plates that are bolted into the top of the walls. There is a small 4" curb on the south of the box that covers the effluent tube. A catwalk runs along the north wall. There is a rough spot with rebar in the north wall below the catwalk, possibly indicating former construction. The rough area is 4' 6" wide.

Primary Clarifiers 3876, 3877, and 3879 are round structures. At these structures, solids were settled out of the waste stream. They were constructed of 8"-thick poured-concrete walls in 3' sections with rounded lips (Figures II-19, II-46, II-47, II-48, II-49, and II-50). The Primary Clarifiers are 56' 8" in diameter. These rise to about 12" above grade. Each clarifier has a 6' section that is about 16" thick, as well as a 3' 4"-by-5' 4" concrete rectangle with a turn-off and a manhole. Beneath the concrete pads were housed the exhaust fans. The thick-walled sections indicate the presence of effluent pipes. Clarifiers 3877 and 3879 have three steps leading to a steel catwalk, while 3878 has only two steps (Figure II-52). Primary Clarifier 3879 has a small light on its catwalk, while the others have larger industrial lights. Clarifier 3878 has a Burkhard and Sons,

Denver, Colorado, manhole and the others have Fountain Iron and Brass Foundry, Pueblo, Colorado, manholes. All three clarifiers have Dorr-Oliver sweeps.

Filter Head Box 3882 has an L-shape, while Filter Head Box 3885 is rectangular (Figures II-20, II-22, and II-23). The walls of both are 8'-thick poured concrete, and both have metal walking grates. Filter Head Box 3882 has metal stairs on the north side. In addition, there are welded-metal 2½" pipes with round bases and a screw shutoff. A new ½-ton crane sits on a concrete base 3' north of 3882 (Figure II-56). Three feet north of the crane is a concrete curb with a brick floor measuring 12' by 15' to hold the drying filter. Curbing, infilled with boards, sits between 3882 and the filter curbs. This also occurs on the south of 3882 to about 5' from the wall. At one time, there may have been a structure on the north side of 3882, as there is a 3' 10" concrete step and bolts built into the wall. Filter Head Box 3885 once had a rectangular crane mounted on its northwest corner. It does not have concrete curbs on its south, east, and west sides. Filter Head Box 3885 shows no evidence of a removed object, as is seen on the north wall of 3882 (Figure II-57). Box 3885 has new aluminum grates.

All four Trickling Filters are contributing buildings at the Waste Water Treatment Plant (Figures II-21, II-53, II-54, and II-55). The round filters used rotating booms to distribute the waste water evenly through a zooglio mass held within a stone medium. All have 12"-thick concrete walls. Filters 3884 and 3886 are 12" lower than 3881 and 3883. The filters are each 73' in diameter (Figure II-58). Each filter has two associated manholes with round metal vents. The manholes are square and measure 5' 4" by 5' 8". Filters 3881 and 3883 have smaller vertical towers and different diffuser jets. This hardware is a recent replacement. Each pipe at 3881 and 3883 has two cables, unlike 3884 and 3886, which have three cables. Filters 3881 and 3883 have split shale, not cobble like 3884 and 3886. New metal vents have been installed at 3881 and 3883.

Secondary Clarifiers 3888, 3892, and 3895 are round structures. The Secondary Clarifiers settled sloughed zooglio material. They are constructed of poured-concrete walls, 8" thick (Figures II-27, II-66, II-68, II-73, and II-75). The Secondary Clarifiers are 61' 8" in diameter. The walls rise to 6" above grade. Secondary Clarifier 3888 has a 2' 7"-by-4' concrete step leading to a Dorr-Oliver catwalk (Figure II-69). Clarifiers 3892 and 3895 have 3'-by-3' 2" steps leading to their catwalks. All catwalks lead to a central pump. Clarifiers 3888 and 3895 have patio lights, while 3892 has a large industrial lamp. There are thick concrete curbs over the effluent tubes of 3892 and 3895 (Figures II-67 and II-76).

The influent was sent from the Secondary Clarifiers to Diversion Box/Parshall Flume 3893, where it was either recirculated or sent through the effluent Parshall Flume. Diversion Box/Parshall Flume 3893 is irregular in shape and has 8"-thick poured-concrete walls with a chamfered lip rising to 12" above grade (Figures II-28 and II-29). The box measures 5' 4" north-south and 4' 8" east-west. The railings are 2½"-diameter welded pipe with round bases. A rebar ladder sits near the influent tubes in the northeast corner. The Parshall Flume has been narrowed by 6" on each side and covered with fiberglass (Figure II-74). The flume measures 28' in length, 5' 4" in width at the north end, and 4' 6" in width at the south end. The oblong wing with the shallow grate on the west has a seam, suggesting that it is not original.

Recirculated influent was drawn from Diversion Box/Parshall Flume 3893 into Recirculating Well 3889, where it was pumped back into the waste stream at Filter Head Box 3885. This process supplies a regular flow through the Trickling Filters during periods of low influent flow.

The Recirculation Well 3889 measures 19' 1" in diameter (Figures II-28 and II-70). It is constructed of poured-concrete walls that end at grade. The walls are 7" thick and were poured in 2' sections. A 20" section of the wall on the west side is 1' in thickness. Yellow railings constructed of welded 2½"-diameter pipe are set in threaded round bases.

Settled sludge from the Primary Clarifiers was diverted to the digester complex. The heated Primary Digester held the sludge for approximately one day until it was pumped to the Secondary Digester, where it sat for 3 to 5 days. Supernatant was piped back to the waste stream for reprocessing; the processed sludge was pumped into the sludge beds.

Primary Digester 3860 and Secondary Digester 3863 are identical except that 3863 is about 3' lower than 3860 (Figures II-11, II-32, II-33, II-34, II-35, and II-38). The digesters are 55' in diameter, round, and have poured-concrete walls that were poured in 33" sections. Each has a sloped, built-up floating roof with gravel and tar/bitumen surfacing. Each roof has six small vents, two capped pipes and a large motor housing, another capped manhole about 30" in diameter, a square access hatch, and a vent stack at the center. Around the outside of each structure earth is built up to about 5' from the wall lip, perhaps 10' to 15' above the original grade. Sludge Holding Tank 3861 formerly sat to the west of the digesters, but was demolished in 1994 (Figure II-12).

About 50' north of Primary Digester 3860 is "Natural Gas Regulator and Methane Regulator PRV 30." This is an 8'-by-16' concrete manhole that rises about 2' above grade. This concrete box is labelled "GAS PRV 30" and has a vent stack and flat metal access hatch on its roof, and one covered vent on each of its east and west sides. Adjacent to this box is an 8'-tall methane gas burnoff. There are two metal voltage switching boxes on concrete pads 25' to the north.

Digester Control Room 3862 sits between digester 3860 and 3863 (Figures II-13, II-36, and II-37). The Control Room is 24' in length by 18' in width. This is a poured-concrete structure with a flat, concrete, built-up tar roof with metal flashing. Walls are about 10" thick. This structure has a full basement with a concrete floor housing pumps to move the sludge. There are three metal stacks and vents on the roof. The control room has one set of metal double doors in metal frames with no surrounds that sit at the original grade. Each door has a vent. A transom vent with a hopper closer sits above the doors. Access to the door is gained by a 96"-wide concrete drive flanked by two concrete-and-concrete-block retaining walls, the north one of which has a set of 24"-wide stairs with a non-original pipe railing. These stairs lead to the roof.

Sludge Beds 3864 and 3865 have an irregular footprint and were constructed with 8"-thick poured-concrete walls that have rounded lips (Figures II-14, II-39, and II-40). Each bed is 316' in length and each half of one bed is 24' in width. The floors are 4"-thick concrete slabs separated by 6" settlement cracks. The floors are covered with peagravel, followed by aggregate, and then a perforated 4" PVC French drain pipe that drains the beds. The PVC pipe replaced earlier clay pipe.

The center sluiceway is 8"-thick concrete. This allows for control of the sludge to either one or both sides of the bed. Each bed has a concrete ramp at either end. Sludge Bed 3864 has a concrete valve box inside the bed, while 3865 has one outside the bed.

Building 3887, the former Administration Building and now the Laboratory and Control Building, is actually two rectangular wood frame buildings joined by one common asphalt-shingle roof to form a single structure separated by a breezeway (Figures II-25, II-26, and II-59). The north building originally acted as an office area and the south building acted as a laboratory and pumping station. The buildings are now used as storage area, a pumping station, and as housing for the control console. The total length of the structure is 89' 7" and the width is 29' 8". The north building is 35' 10" by approximately 20', while the south building is 40' 2" by 30' 1". The breezeway is 11' 10" wide and 21' 4" long. The roof is cross-gabled with a moderate pitch. The roof has overhung boxed eaves on the eave sides. These are flush on the gables. It has interlocking grey shingles over rolled asphalt roofing. Roughsawn boards and 1"-by-8" fascia enclose the overhung rafters. The walls have 6" simple drop siding with 1"-by-4" corner moldings. The structure has a basement under the south half of the south building. The north building does not have a basement but is built on a concrete slab at grade. Building 3887 has four stovepipes, one bent-over vent stack, and five ventilators on the ridge. The windows are aluminum combination 3-light windows with the upper and lower lights fixed and the middle light a hopper-type light. These sit in aluminum frames and the windows have aluminum surrounds screwed to the wood siding. All windows are covered with metal mesh. There is one window on the north, eight on the west, two on the south, and eight on the east (Figures II-60 and II-61). One door is on the west side and two are on the south (one double and one single). The single door has an original screen door. The north side of the breezeway has double doors. All doors are non-original wood doors in wood frames with 1" by 2" casings. The breezeway has a concrete floor, and the south doors have a concrete dock measuring 5' by 18', accessed by metal stairs to the east. The south building's interior has a concrete floor and stuccoed walls with a wainscot of horizontal 3½" tongue-in-groove boards. A hole in the floor and an I-beam crane can move plumbing equipment from the basement (Figure II-64). Another I-beam goes from the north building across the breezeway (Figure II-24). The floors have 9" tiles and the ceilings have 1' perforated tiles. The interior walls in the south building have been recovered, new windows and electrical system have been installed, new gas forced-air heaters replaced the steam registers, and ceilings were added. The original lab equipment is still in the south building (Figures II-62 and II-63). The large crane double doors to the south building were removed and replaced with a single door, new lighting was installed, and some siding was replaced. A small bay equipment box was hung on the east wall of the north building and a ceiling was added (Figure II-65).

Contributing Buildings at 5EP2446

At 5EP2446, Incinerators 3850, 3851, and 3852 are all contributing buildings to the eligibility of the site for the National Register of Historic Places (Figure II-30). All three incinerators are nearly identical in construction, although the interior of the buildings has changed over time (Figure II-78). The incinerators measure 29' by 28' and are two-story structures. They are nearly square, with adjacent cylindrical chimneys. The chimney is connected to the building through the basement by a concrete tunnel. The hip roofs are steep pitched and supported by steel

trusswork. All the roofs have steel gutters and are covered with dark gray slate. The walls of the incinerators are red brick, laid in a common bond with a corbel at the roofline. The concrete foundations have horizontal relief joints every 21½". The concrete foundation walls are 13½" thick and the floor is 7" thick. All three incinerators have basements exiting on the southern side of the building at ground level. The first floor is at ground level on the north side of the building. The northern walls of the burners have been reduced to rubble in the basements of 3850 and 3852 (Figures II-81 and II-82). Curved red brick measuring 5" by 7" (nominal) was used in constructing the chimneys. The concrete foundation for each chimney is approximately 20' tall and the base is approximately 10' in diameter. Each chimney is located 10' east of the building it serves and is approximately 40 to 50' tall. Chimneys are slightly tapering inward until a corbeled course at the top, which supports a concrete collar.

Each incinerator has sets of two 6-light windows measuring 3' by 6'. There are two windows in the south and west walls, one in the east wall, one single-light window on the north side, two sets of 6-light windows in the south basement wall, and one set in the west basement wall. These are all swinging metal windows. The single-light window on the north wall and one of the basement windows on the south wall of 3852 have been boarded over. Incinerator 3850 has 16"-by-30" metal louvers at the first-floor level and at the ceiling basement level on the north (1), the east (1), the west (2), the north basement (1), and the south near the roofline (1) (Figures II-79 and II-80). These all have 1/4" steel shutters. Incinerator 3850 has one non-original overhead wood garage door on the north side and one original single sliding metal door in a metal frame with 4-over-2 light glazing on the south side of the basement. Incinerator 3851 has one single solid-core wooden door on the north side of the first floor, and double metal doors on the south side of the basement. Doors on Incinerator 3852 include an overhead garage door on the north side, and a single wooden door on the south side. This doorway was larger in the past but has now been partially covered with concrete. All three incinerators have a porch on the north side, approximately 7' wide and running the length of the building. The porches have concrete ramps leading to them and have 6" angle iron bumpers.

Incinerator 3850 is presently used to burn government documents. It now contains a gas-fired incinerator. All of the ovens have been destroyed (Figure II-83).

At Incinerator 3851, the ovens have been removed and the walls painted. The square drop boxes in the first floor were closed, a concrete floor was poured in the basement, the original doors were removed in the basement and replaced with a double wood door, the first floor door was blocked and closed with concrete masonry units, the dock was covered with asphalt, the floors were tiled with 9" tile, and a glazed wood door was installed on the first floor (Figures II-84 and II-85). In addition, a new ceiling was installed, and an office room, a latrine, and a kitchen were constructed. Incinerator 3851 is presently used by water and corrosion technicians. They maintain an office on the first floor and a shop in the basement. The chimney is unused and is blocked by cabinets in the basement. Incinerator 3852 is presently used as a preventive maintenance shop (Figure II-86). The north garage door at this incinerator was blocked with concrete masonry units and now has a wooden pedestrian door and a boarded-over window. The interior was painted, the floor tiled, and a drop ceiling installed in several rooms. The rear door was replaced with a single wood door, and grates were added over the window. Concrete stairs were added to the loading dock, and several

rooms were added inside the structure on the first floor (Figures II-31, II-87, and II-88). In addition, new metal railings were installed on the dock, and two new stove pipes were installed inside.

Non-Contributing Buildings

Sludge Bed 3866 is similar to the 1942-era Sludge Beds 3864 and 3865 (Figures II-15, II-39, II-40, and II-41). It measures 322' in length and about 30' in width. This is an open-roofed rectangular building consisting of a concrete floor with drainage slits. The low concrete wall extends about 18" above grade. A concrete wall subdivides the space into two large drying beds and supports the sludge pipe and valvecocks. Each drying bed is further divided in half by a raised concrete slab that serves as vehicular access. Ramps lead from these to the beds. The drainage slits are filled with loose gravel, and perforated PVC drain pipes that drain the beds. The filter medium was replaced in 1996.

The Chlorination Building 3867 is a rectangular building measuring 32' by 17' 4", with a basement under the south half of the structure accessed by a large hole in the concrete floor. The building sits on a poured-concrete foundation and has concrete masonry unit walls. The roof of the structure is flat and is composed of one-way waffle slabs with built-up roofing, an aluminum cornice band, and scuppers and gutters. Two 40"-by-24" metal louvered vents are on the west wall. One set of metal double doors is situated on the north and is bisected by a crane. One single metal door is on the east side of the structure and two are on the west. There are two rooms on the interior, one for pumps and one for two two-ton chlorine tanks. These rooms are divided by a wall with no door but one window. There is a large blue emergency light on the interior east wall.

The Emergency Generator Building 3868 is a utilitarian, rectangular building measuring 18' 8" by 15' 4", with one set of metal double doors on the east side, one 6'-by-3' 4" metal louvered vent on the south, and one 4'-by-4' vent on the west. Building 3868 is constructed of concrete masonry unit walls on a poured-concrete foundation. An electric radiator sits 1' from the west wall, a transformer sits 3' from the north wall with subgrade access to the building for electrical lines, and a 2,000-gallon fuel tank sits on the south side. The building has a stove pipe on the east corner. The roof is flat, with one-way waffle slabs covered with built-up roofing and an aluminum cornice band. Scuppers and gutters provide drainage for the roof. Additional electrical wiring was installed, and specified machinery was upgraded in 1981.

The Chlorine Contact Chamber 3869 is an irregular-shaped building measuring approximately 45' by 65'. The structure contains two chambers, each with a series of parallel concrete walls that create long narrow channels through which waste water runs. The channels are spanned by a concrete and steel catwalk. Two check valves with hand wheels and sluice gates are at the north influent side of the chamber. The catwalks and perimeter building walls have yellow 1-½"-diameter pipe railings. Treated water circulates throughout the channels to evenly distribute the chlorine. In 1978, piping and gate revisions were made, and the sulfonating equipment was removed. The related De-Sulfonator Building was sided with insulated siding and had electrical improvements made in 1982.

Grit Washer 3871 measures 24' by 16' and is a rectangular one-room building holding the mechanical grit classifier, the separator, and hopper. The structure is constructed of concrete masonry unit walls and sits on a poured-concrete foundation. The metal mezzanine level provides access to mechanical equipment. There is one 12" by 16" metal vent on each of the north and south walls, one 10' by 10' metal garage door on the east side, and one wood pedestrian door on the north side. Both doors have steel lintels and curbs. The building has a flat roof with a wide aluminum cornice band. The building sits between the Degritter 3872 and the influent Parshall Flume/Comminutor/Barminutor. Building 3871 has a stove pipe for its heating system on the northeast corner. The classifier mechanics were replaced in 1977.

Degritter 3872 is an almost rectangular open-roofed structure measuring about 15' by 11' 5-½", with a poured-concrete foundation. The poured-concrete and concrete masonry unit walls rise about 2' above grade. The structure consists of a degritting chamber in which rotates a motorized scraper. Surrounding this chamber are influent and effluent channels. Steel catwalks provide access to the gate valves and the scraper mechanism. A concrete sidewalk covered with steel grates sits at the building's north edge. The degritter sits immediately northwest of the Grit Washer Building 3871. Two courses of concrete masonry unit block were laid above the building's perimeter walls at an unknown date.

The Standby Generator Plant 3873 is a square building measuring 18' by 18', with an almost flat shed roof that slopes to the southeast. The overhung eaves on the roof are boxed. The wood frame walls have 7" simple drop siding with 1"-by-3" vertical corner molding. The walls sit on a grade-level foundation or concrete slab. One pedestrian door is wood, with a 1"-by-3" casing and metal sill. One 10'-by-10' garage door is metal with similar casing. Both doors are on the building's northwest wall.

Electrical Power Building 3874 measures 12' 8" by 8' and has a poured-concrete foundation, floor, and roof. The walls are constructed of concrete masonry units and have a wide aluminum cornice band at the roofline. There is one 16"-by-16" exhaust vent with metal louvers on each of the south and east sides. There is one 48"-by-48" 3-light metal frame combination window on the south wall. The upper two lights are fixed and the lower light is a hopper sash. The interior is painted block and concrete. The heated building houses a large electrical panel that sits on a 4"-tall raised concrete platform. A 24"-by-36"-by-43" metal electrical panel sits near the building's west side. The structure has a single metal entrance door on the west.

The Primary Sludge Pump Building 3880 has a poured-concrete foundation, concrete masonry unit walls, and measures 18' by 24'. The basement is accessed by metal stairs. The first floor is one large room with painted block walls. The roof is flat, composed of 1-way waffle slabs with built-up roofing, an aluminum cornice band, and scuppers and gutters. There is one 24"-by-24" metal louvered vent on the west wall, and one forced-air bell vent. There is also one 14"-by-14" window on the west wall. A door with a wire glass window light is centered on the west wall. The basement has a concrete floor and houses sludge pumps. The first floor houses only a horizontal architectural plan file and some valves.

Diversion Box 3894 is a square structure measuring 7' 3" by 7' 3". It has 8"-thick poured-concrete walls that rise 9" above grade and have chamfered edges. The box has a yellow iron railing 1½" in diameter, sunk into concrete. There are two check valves with turn handles on the west and south sides.

Backwash Basin 3896 is a poured-concrete, round, roofless holding basin with walls that rise approximately 1' above grade (Figure II-18). The floor sits approximately 9' below grade. The walls and floor are reinforced concrete and the basin measures 41' 4" in diameter. The structure has a capacity of 80,337 gallons. A yellow 1½"-diameter pipe railing tops the basin walls. These are held to the wall lip with plates bolted into the concrete. A ladder hangs on the west side next to a 1' 6" by 3' concrete weir tank which protects the overflow pipe. A rectangular concrete slab approximately 10' north of the Holding Basin covers a Backwash Return Pump Station. This underground pump station houses pumps and valves that control flow into and out of the basin.

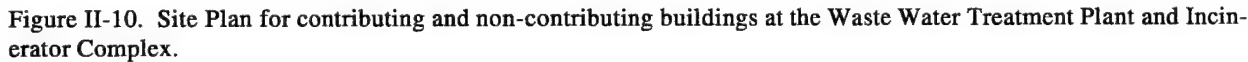
The Tertiary Filter Building 3897 is a rectangular building measuring 76' 8" by 38' 8", with a sub-basement at the southeast corner of the structure. The sub-basement houses pipes and valves. The building's roof is flat, composed of one-way waffle slabs with built-up roofing, an aluminum cornice band, and scuppers and gutters. The walls are painted concrete masonry unit block. There are two 40"-by-24" metal louvered vents on the west wall, and there is one unglazed metal door on the east side. The west side has a glazed door and a 10'-by-10' garage door. A single interior room houses sand filters and an aluminum sulfate tank, not presently used. The building is heated. A 100-square-foot wood frame lean-to has been recently constructed against the building's north wall. A large addition completed soon after the initial construction more than doubled the size of this building.

An effluent Parshall Flume and Diversion Box 3899, both with concrete walls, sit to the east of Building 3897. Diversion Box 3899 diverts stream flow to the tertiary complex. The Parshall Flume meters stream flow leaving the secondary clarifiers and entering the chlorination complex. Diversion Box 3899 is 9' 4" square, with the southwest corner cut away. It has 5"-thick poured-concrete walls with chamfered edges rising 1' 3" above grade. The box is topped with a metal grate and has a check valve with a turn wheel (Figure II-77).

Laboratory and Control Building 3900 is the most decorative building on the site. It measures 60' by 40' 8" and faces north. The walls feature a corbeled concrete masonry unit cornice line. The roof is flat, composed of one-way waffle slabs with built-up roofing, an aluminum cornice band, and scuppers and gutters. The windows are paired casements in wood frames. There are three windows on the east side, one on the south, two on the west, and four on the north. There is one single door on each of the south and north sides, and one set of double doors on the east and west sides. The north doors are glass, while the remainder are metal. There are two 16'-by-16" metal vents on the east wall. The interior has tile floors and gypsum board walls. New or additional circuitry was installed in the control panels in 1985.

The Flow Equalization Chamber does not have an official building number. This structure measures 92'-by-92' and has a 500,000-gallon capacity. It consists of two large concrete chambers, each with concrete floors and concrete walls that rise to approximately 1' above grade. Each

chamber has two drains and two mechanical surface aerators. Steel and concrete catwalks span the chambers. At the building's south side, three mechanical screw pumps transfer waste water to an influent Parshall Flume. An additional influent Parshall Flume and headworks sit immediately west of the building. The headworks contains a comminutor and barminutor. New ladders and an emergency overflow pipe were installed in 1984 at the Flow Equalization Chamber.



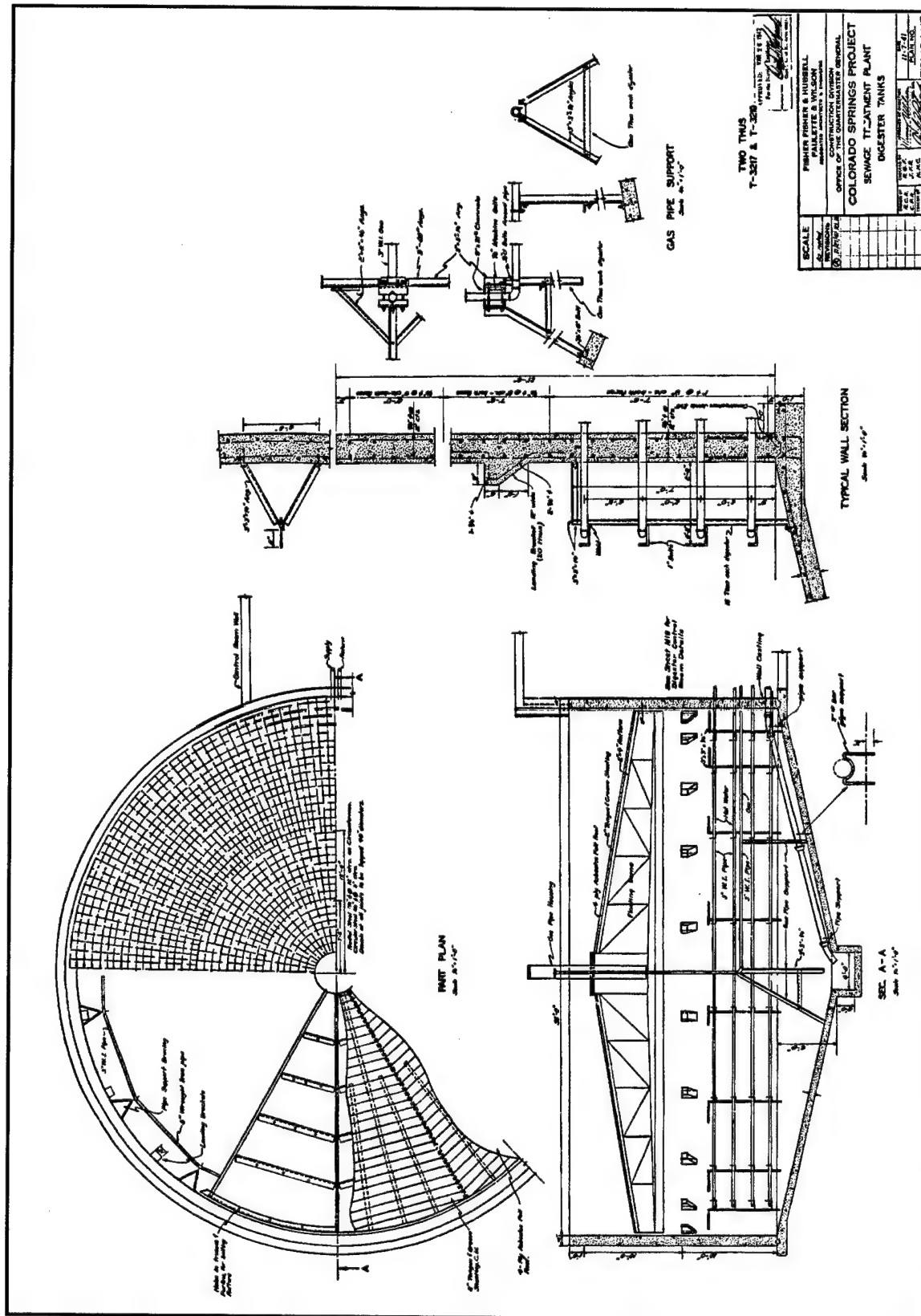


Figure II-11. Plans and sections for Primary and Secondary Digesters 3860 and 3863. Sewage Treatment Plant Digester Tanks. Plan 7131-15-M17 2G.

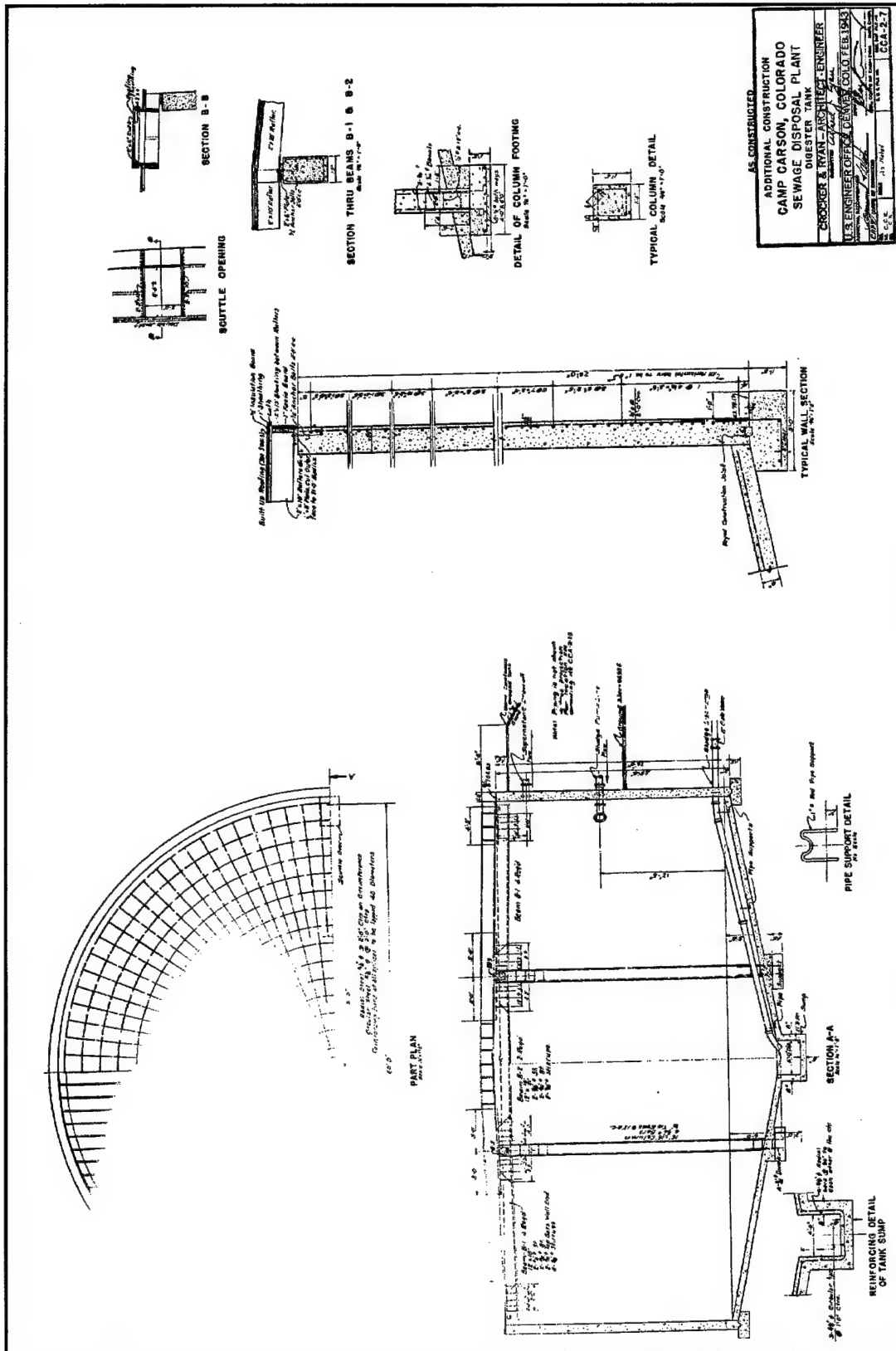


Figure II-12. Plans, sections, and details for Sludge Holding Tank 3861. Sewage Disposal Plant Digester Tank, Plan CCA-2-7 3S.

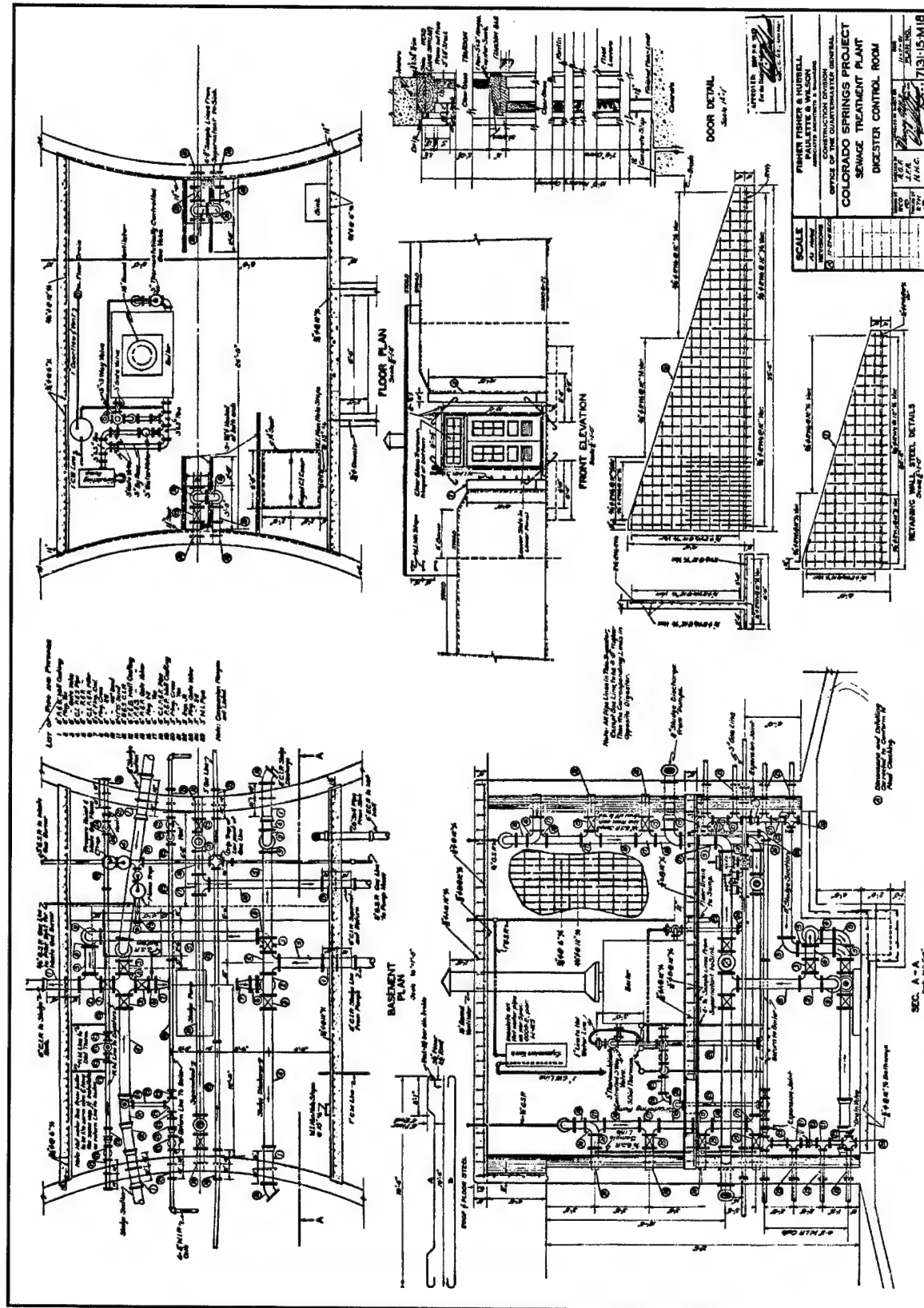
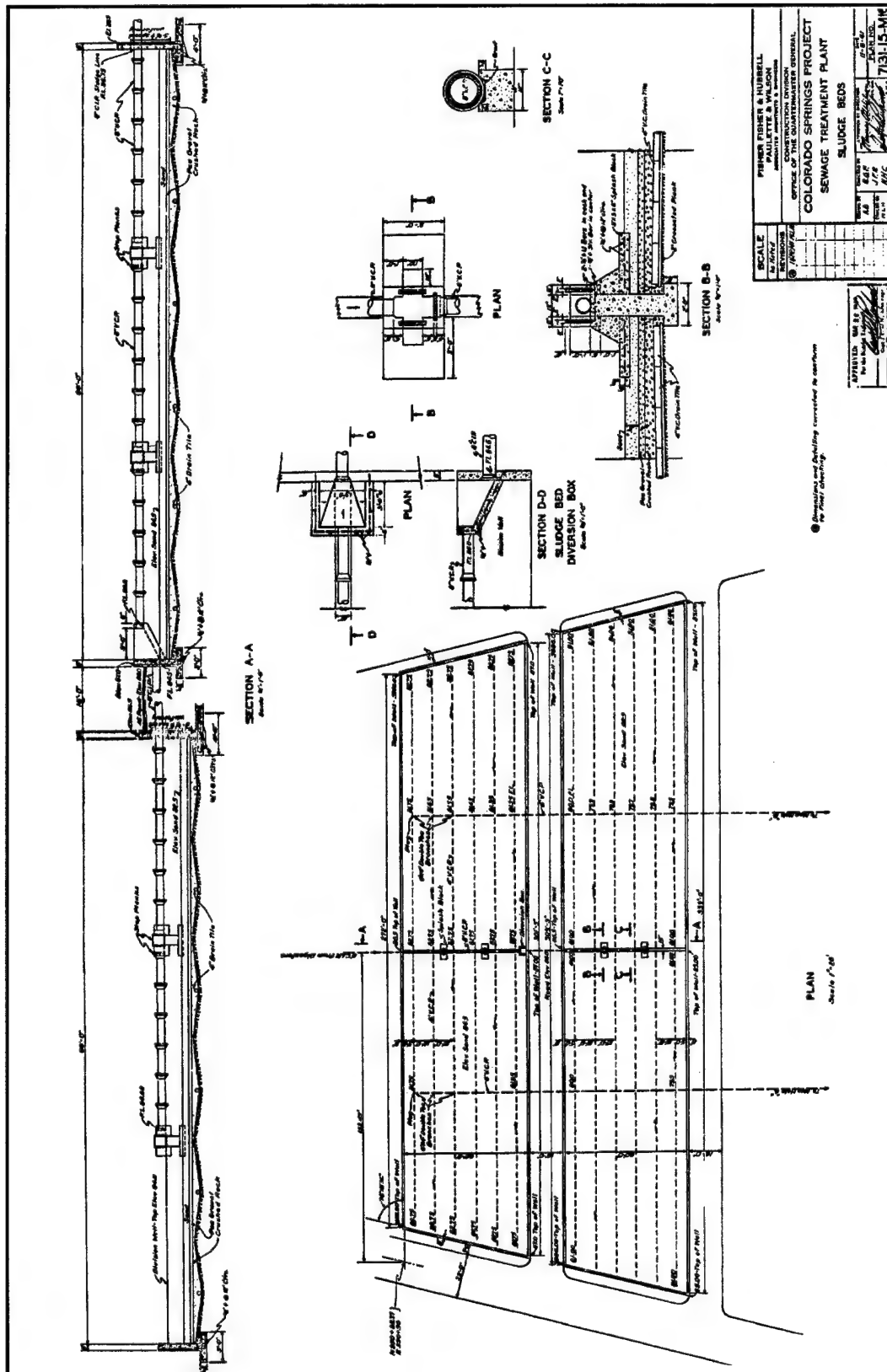


Figure II-13. Plans, elevations, sections, and equipment layouts for Digester Control Room 3862. Sewage Treatment Plant Digester Control Room. Plan 7131-15-M18 2G.





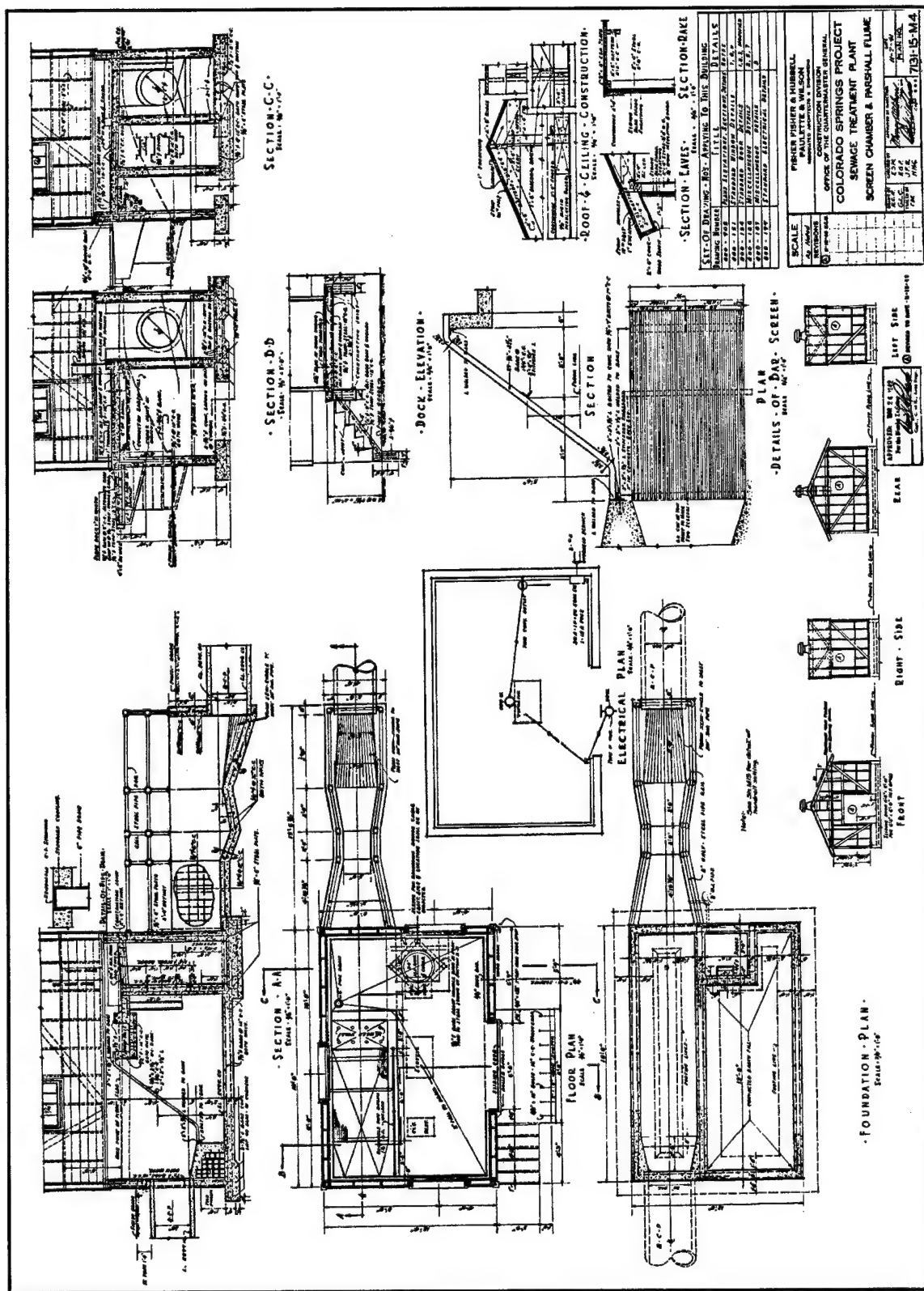
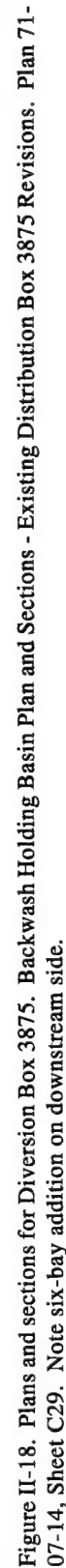


Figure II-16. Plans, sections, and details for Screen House 3870. Screen Chamber and Parshall Flume. Note that Parshall Flume in plan demolished in 1985. Plan 7131-15-M4 2G.



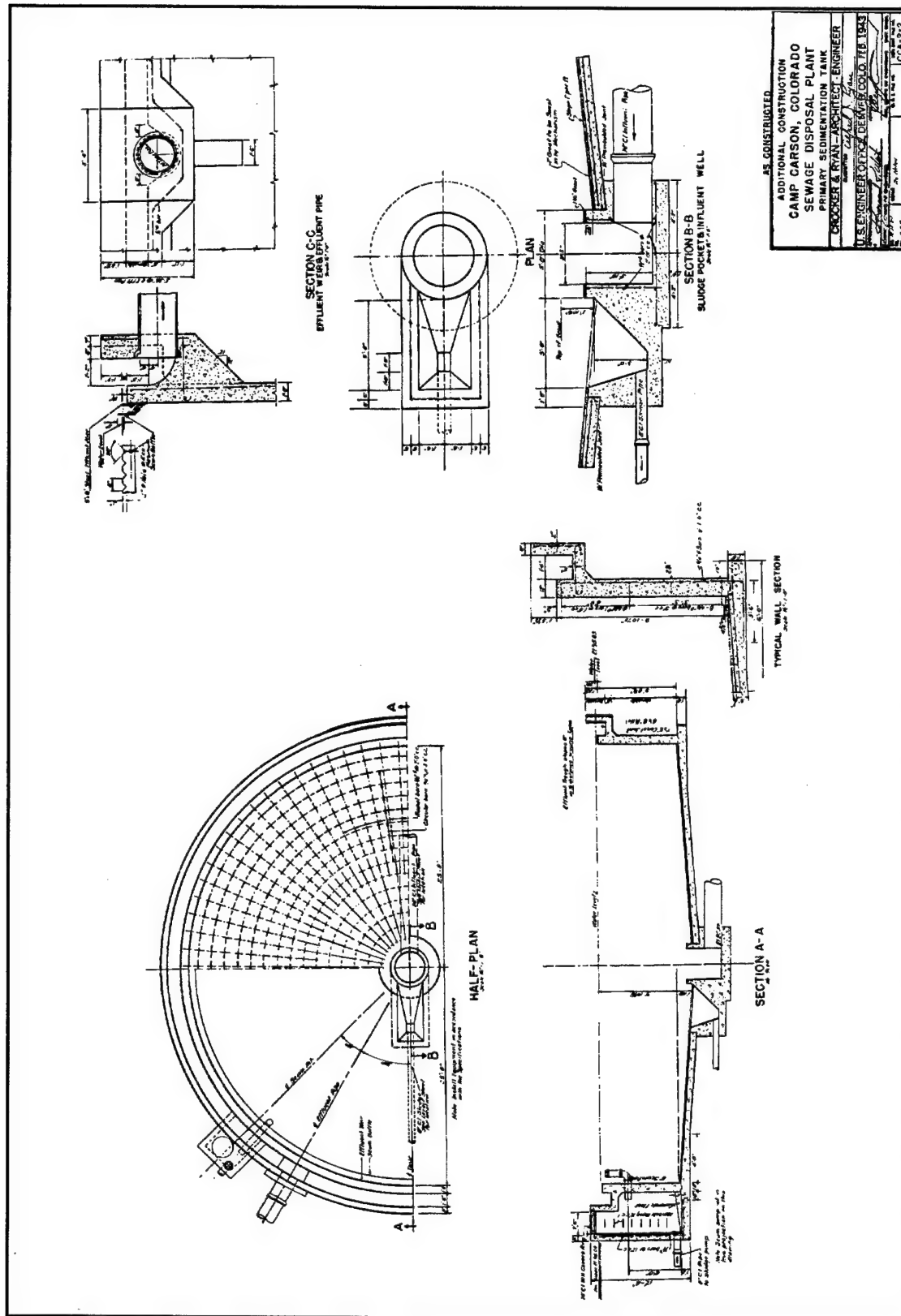


Figure II-19. Plans, sections, and details for Primary Clarifiers 3876, 3877, and 3879. Sewage Disposal Plant - Primary Sedimentation Tank. Plan CCA-2-2 3S.

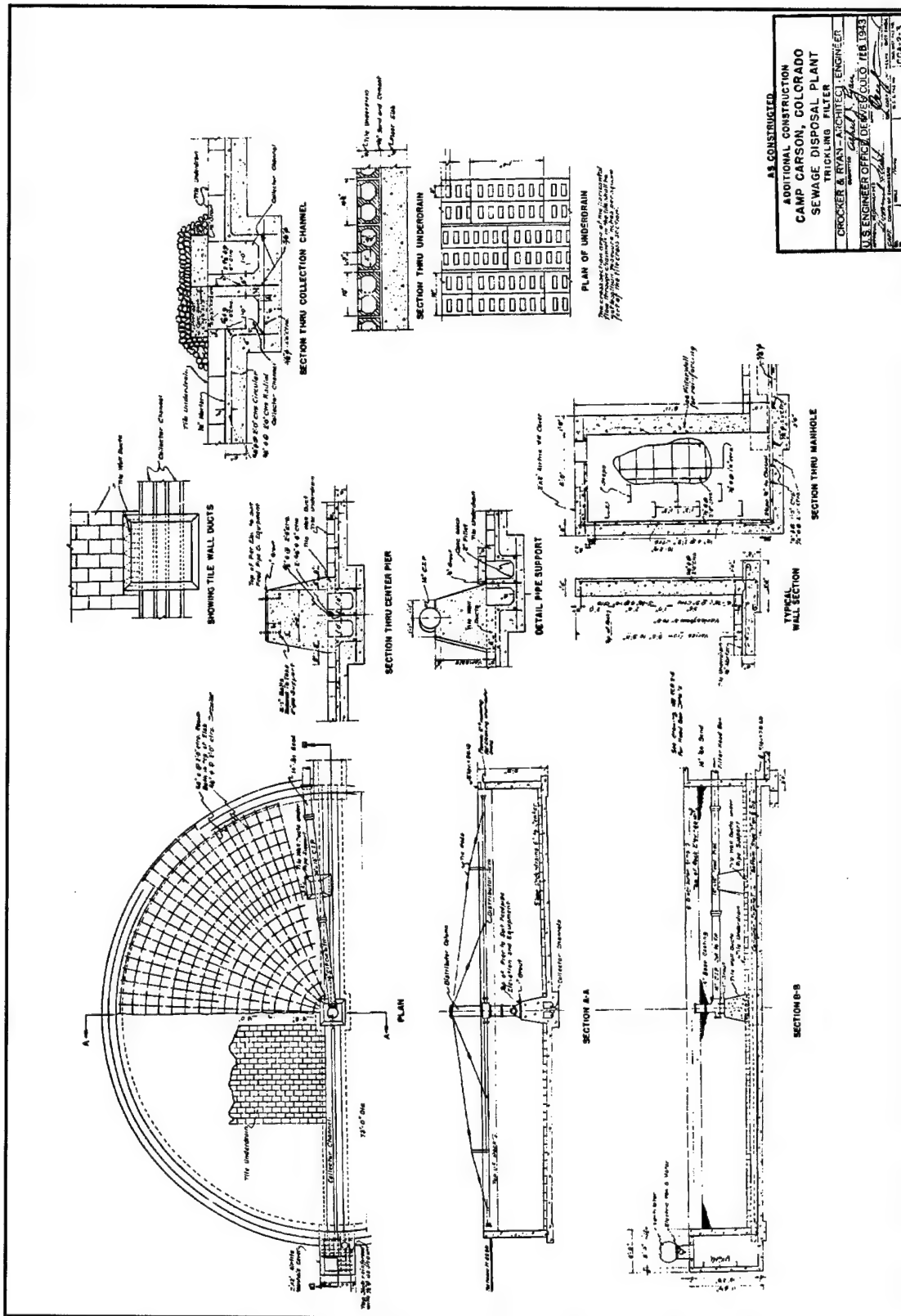
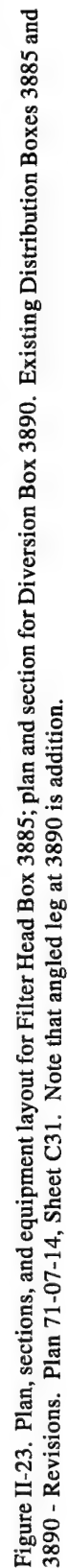


Figure II-21. Plans, sections, and details for Trickling Filters 3881, 3883, 3884, and 3886. Sewage Disposal Plant - Trickling Filter. Plan CCA-2-3.

Figure II-22. Plan, sections, and details for Filter Head Boxes 3882 and 3885. Filter Head Boxes - Rehabilitation. Plan PES.121.8.



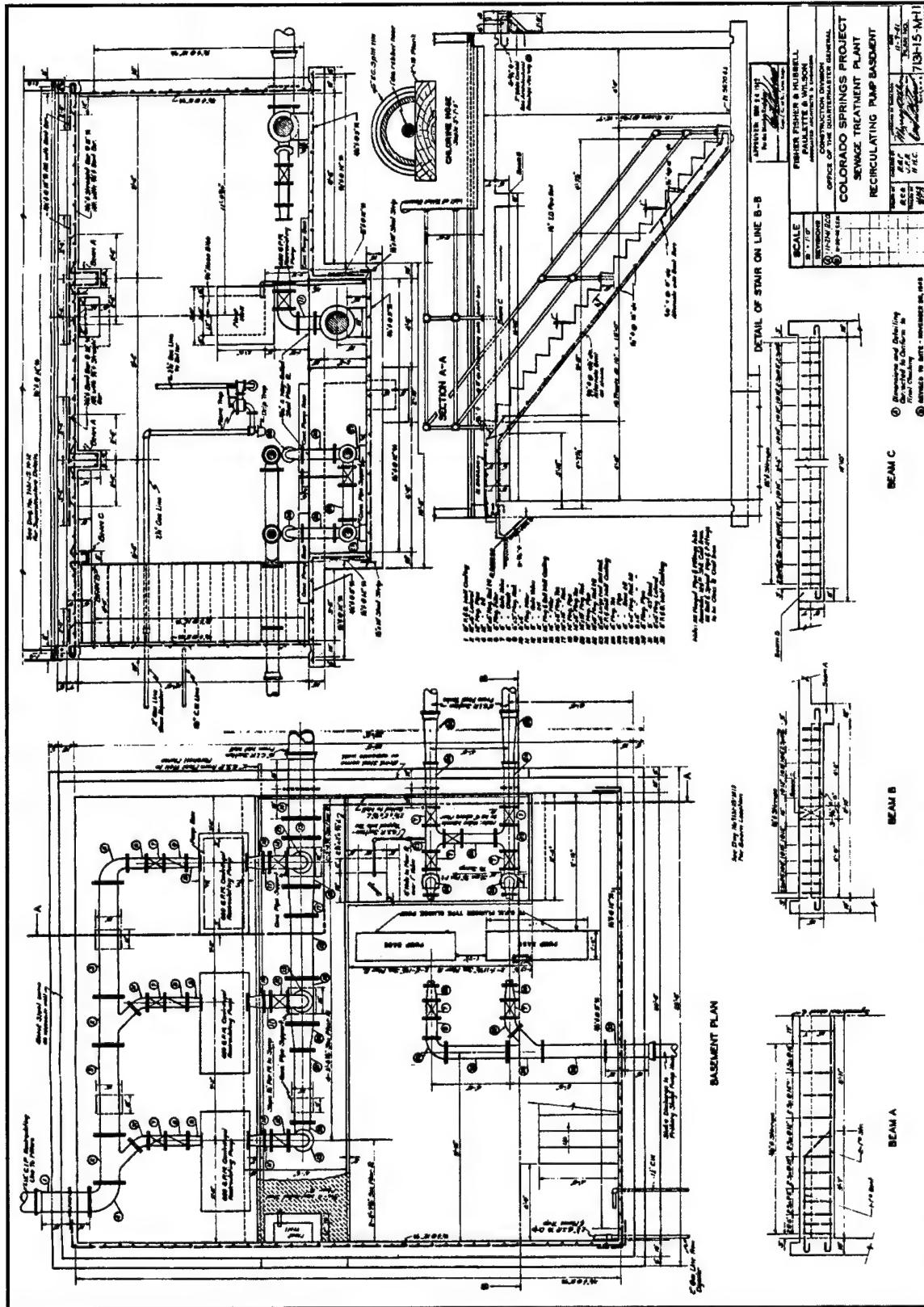


Figure II-24. Plans, sections, and details for pump room at Laboratory and Control 3887. Recirculating Pump Basement. Plan 7131-15-M11 2G.

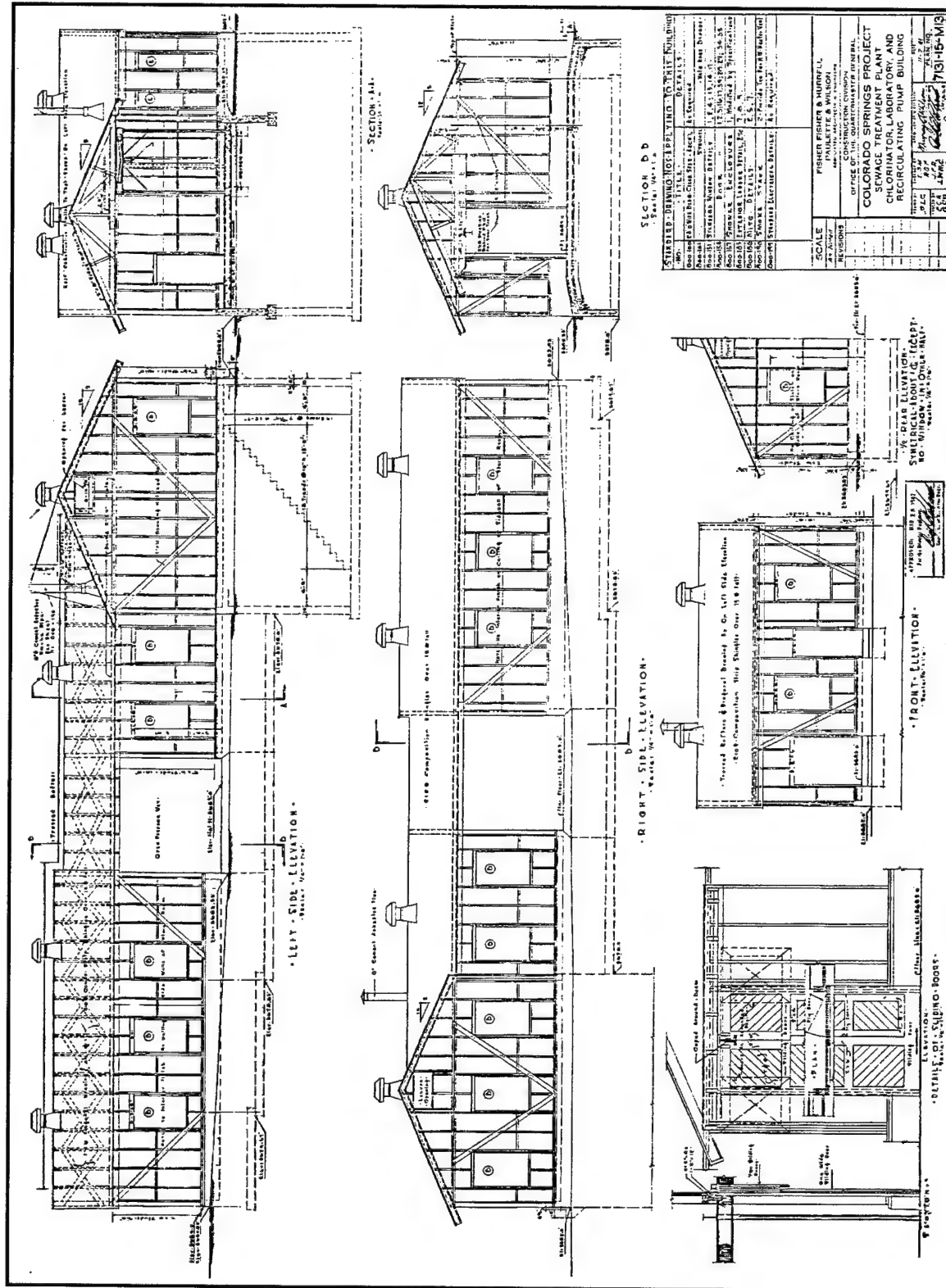
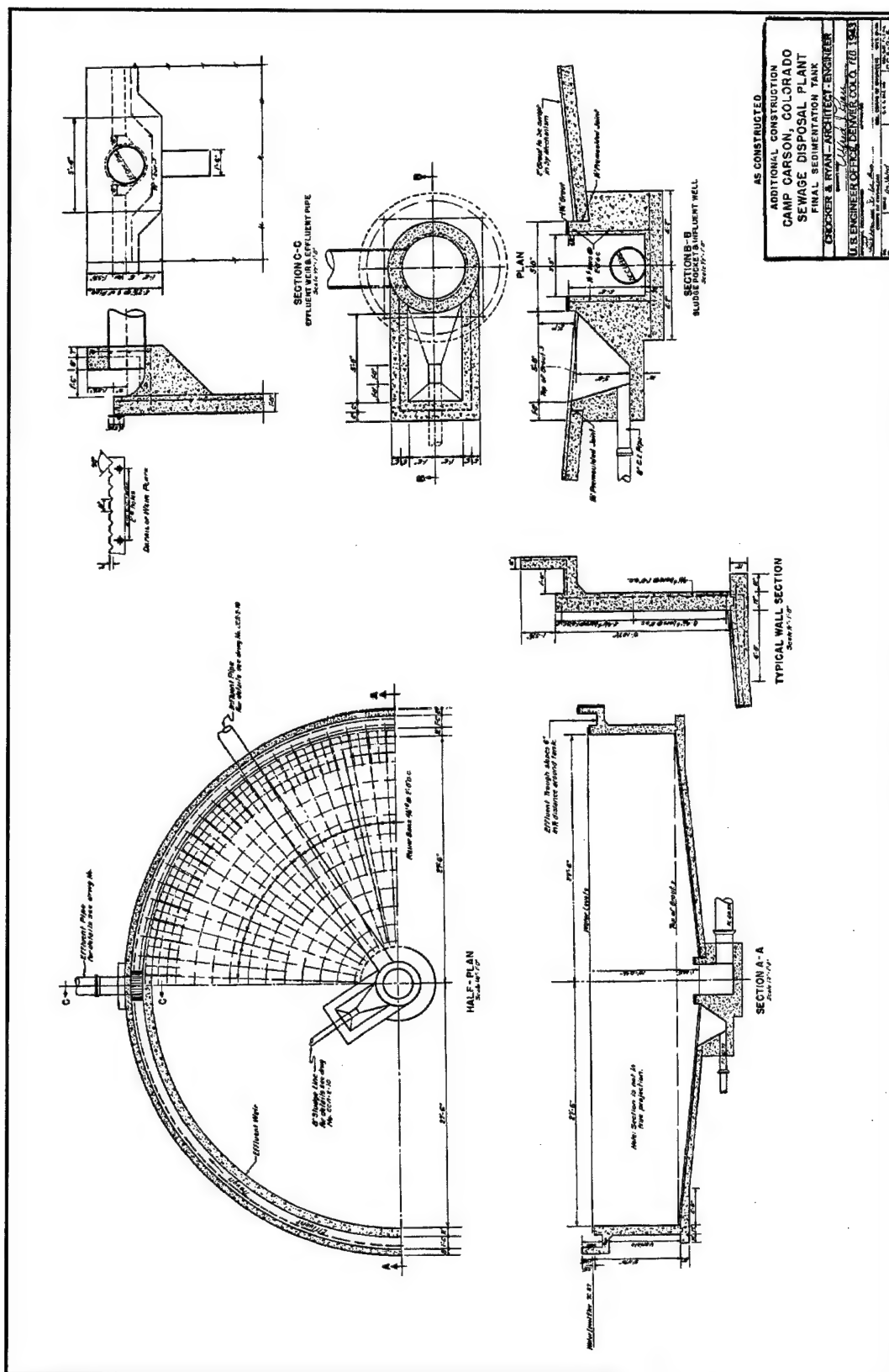


Figure II-25. Framing plans, sections, and details for Laboratory and Control 3887. Chlorinator, Laboratory, and Recirculating Pump Building. Plan 7131-15-M13 2G.



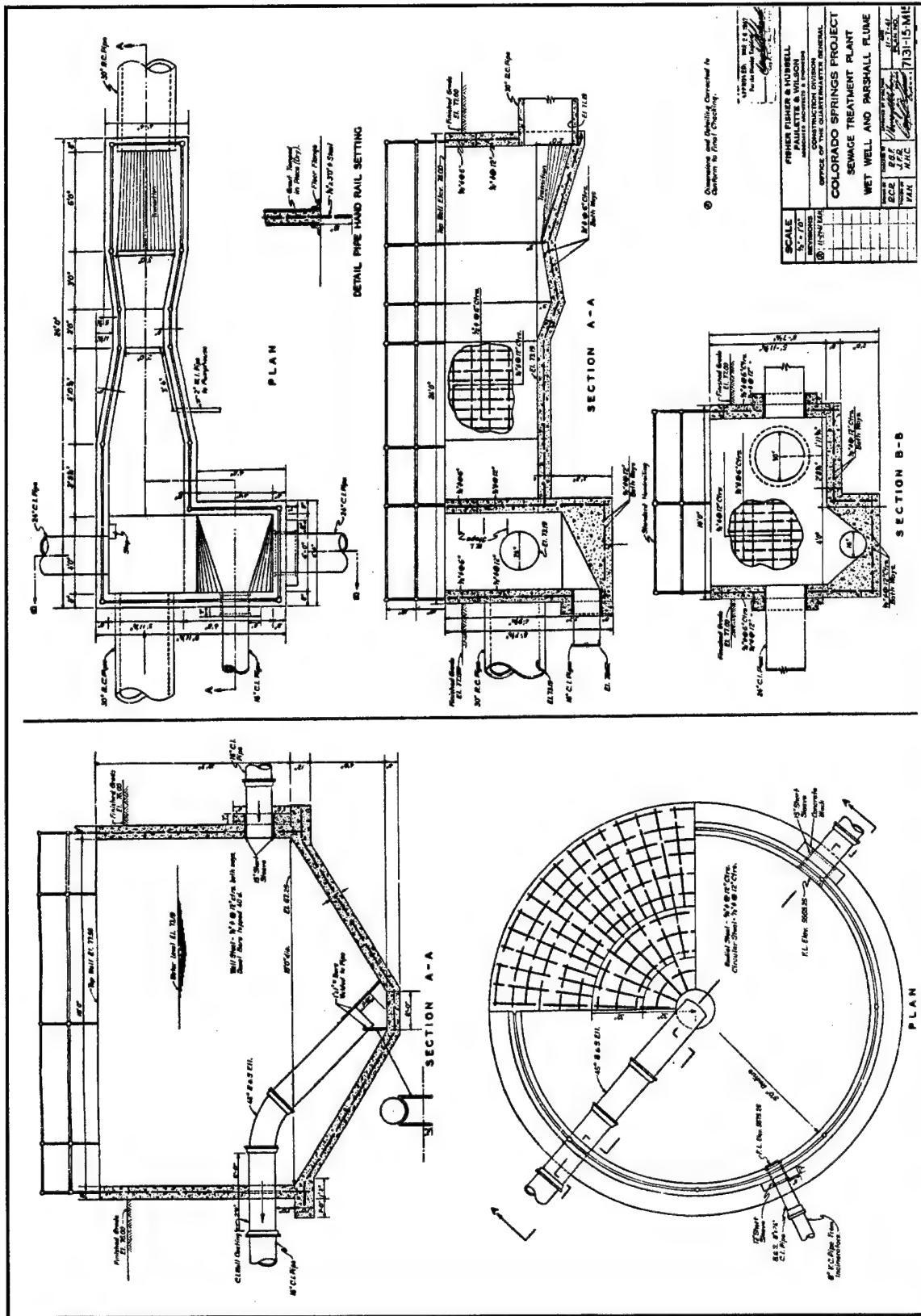
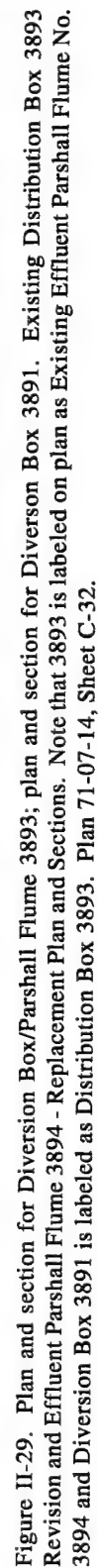


Figure II-28. Plan and section for Recirculation Well 3889; plan and sections for Diversion Box/Parshall Flume 3893. Wet Well and Parshall Flume. Plan 7131-15-M15 2G.



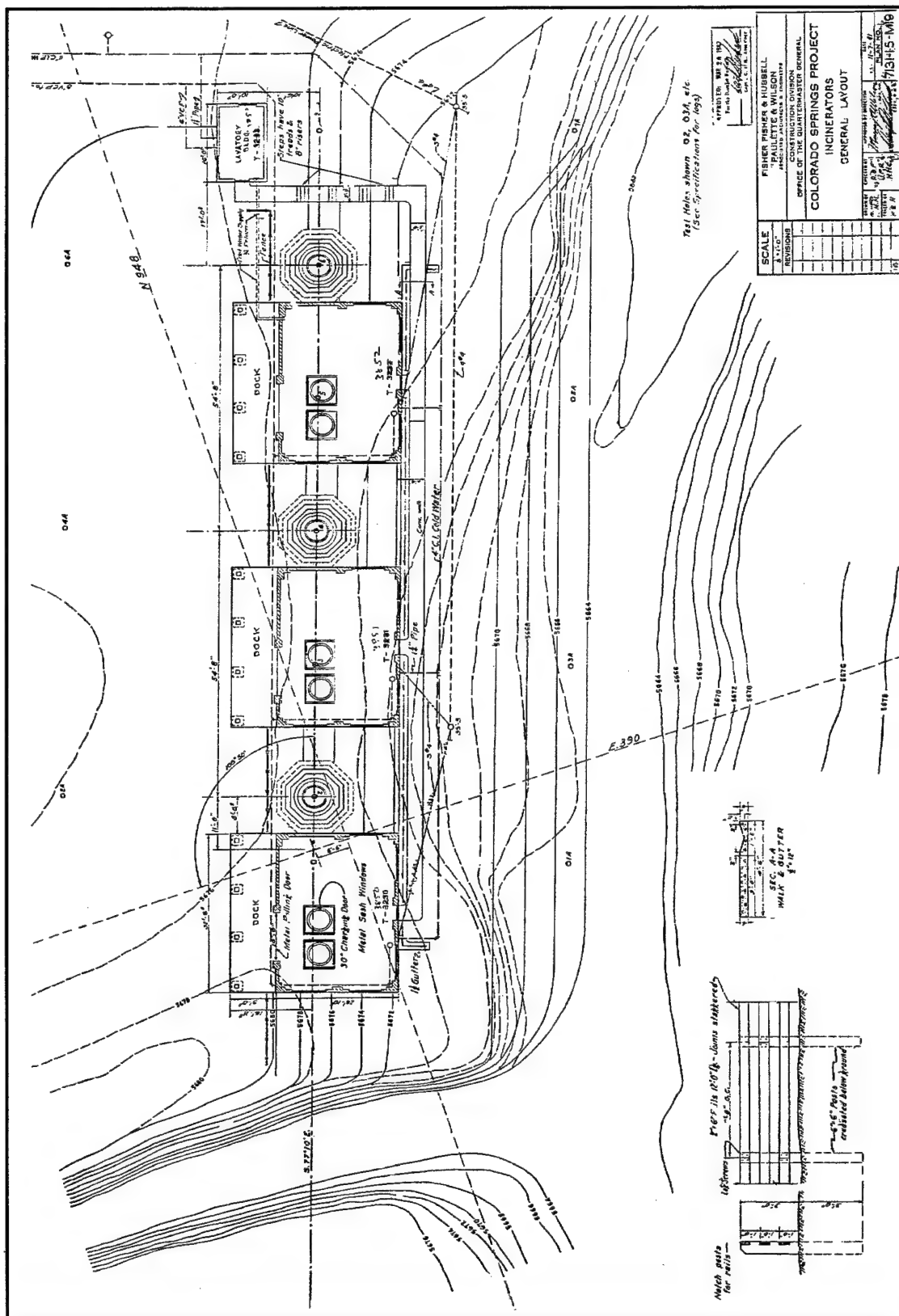


Figure II-30. Plans for Buildings 3850, 3851, and 3852, Incinerators, Plan 7131-15-M19.

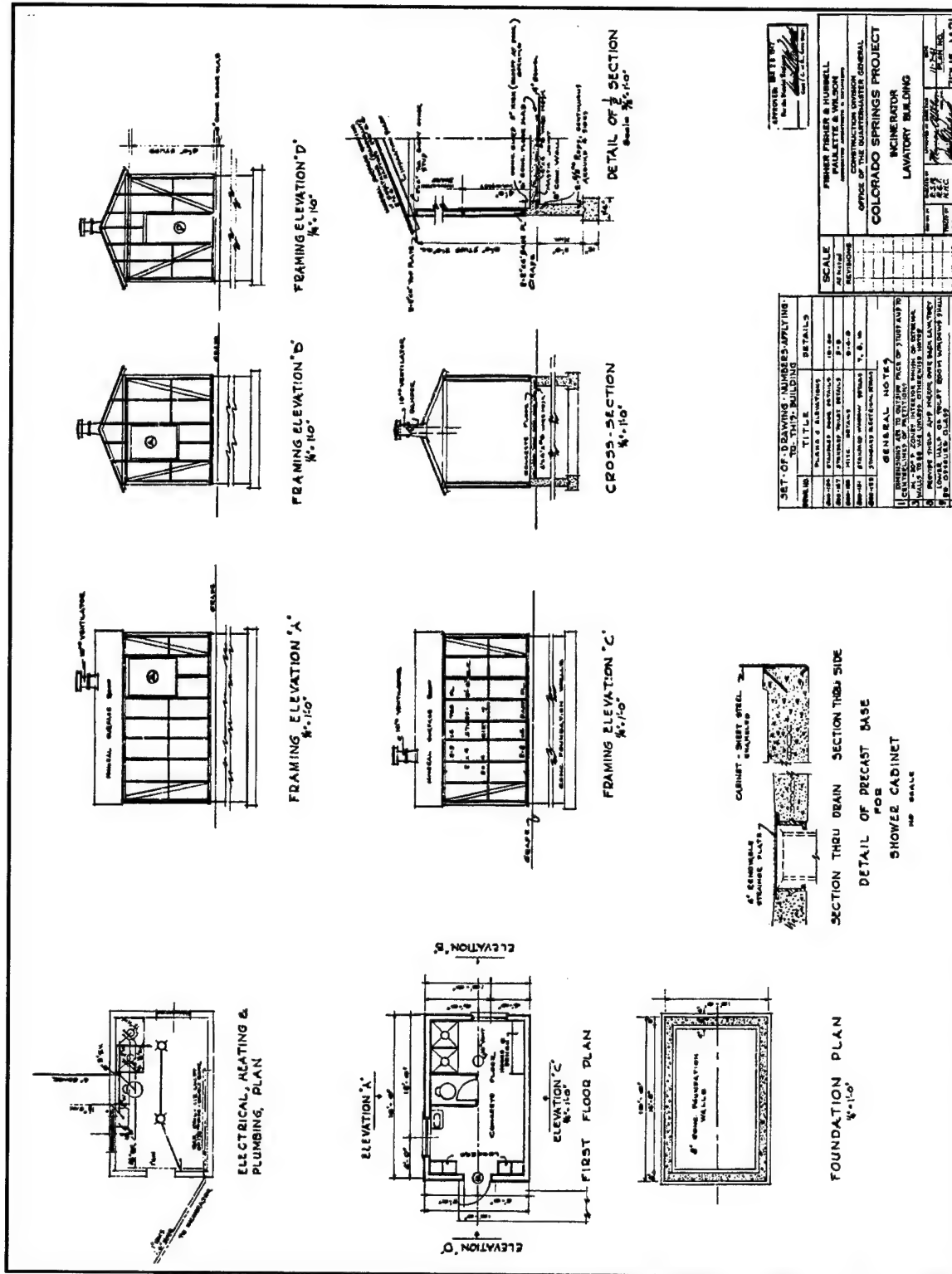


Figure II-31. Plans for Building 3853, Incinerator Lavatory Building, Plan 7131-15-M21 2G.

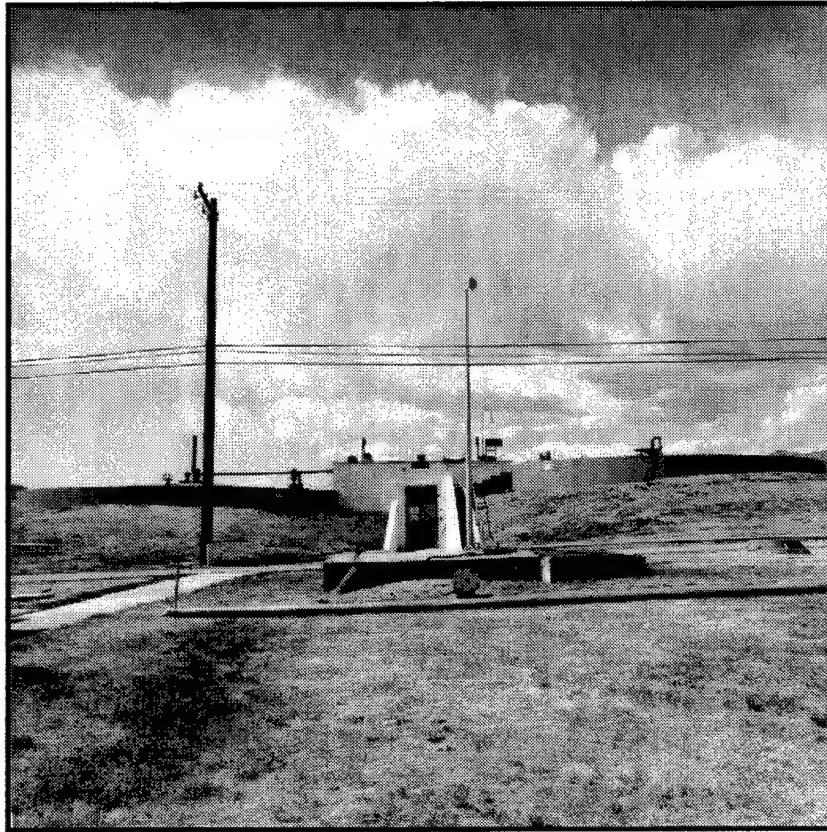


Figure II-32. Frontal View of Digesters 3860 and 3863, and Control Building 3862. View to the Southwest. Roll HH9, Exposure 2.



Figure II-33. Side View of Secondary Digester 3863. View from Sludge Beds. Roll HH10, Exposure 9.

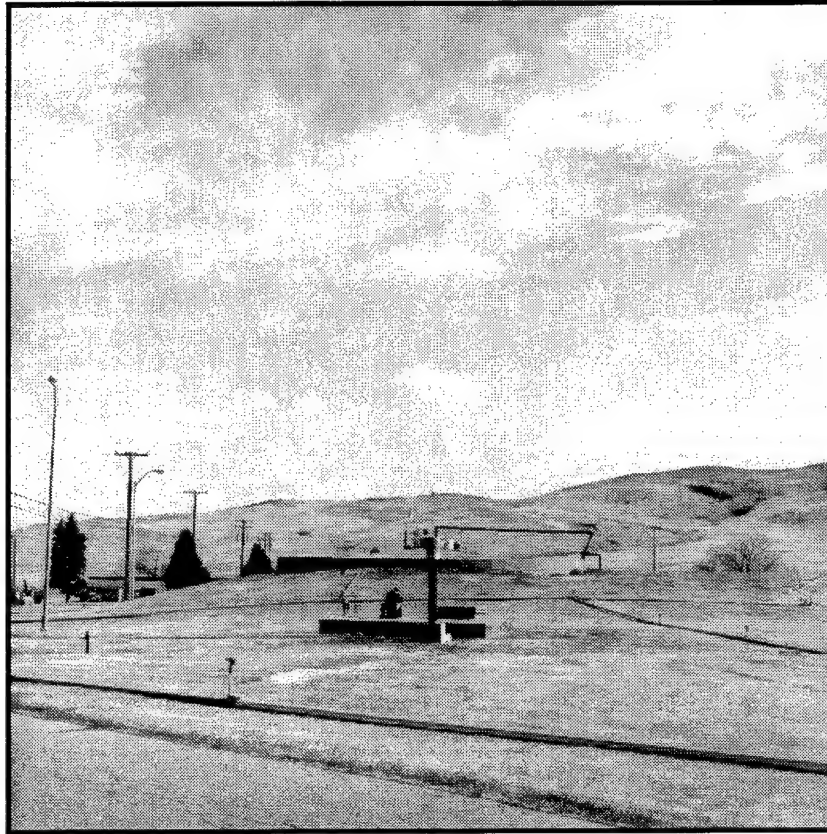


Figure II-34. Side View of Primary Digester 3860. Natural Gas Valve Box and PRV 30 in Foreground. These Process and Burn Methane from Digesters. Roll HH11, Exposure 6.

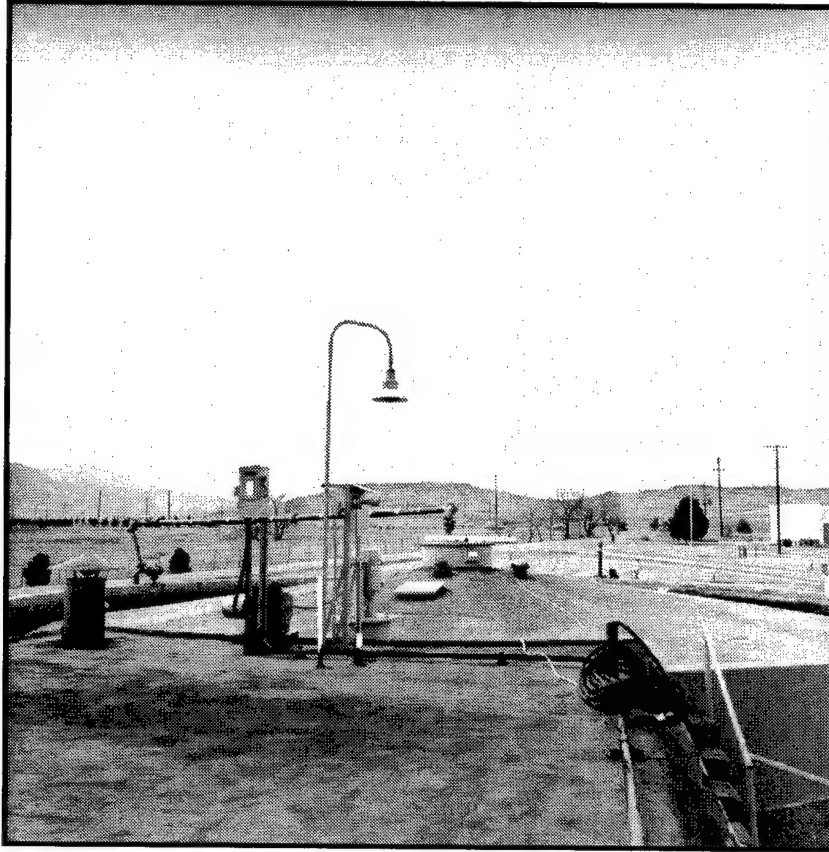


Figure II-35. Detail View of Floating Roof, Primary Digester 3860. Photo from Roof of Control Building. Note Vents, Access Hatches and Gas Collection System. View to the Northwest. Roll HH12, Exposure 2. 222.

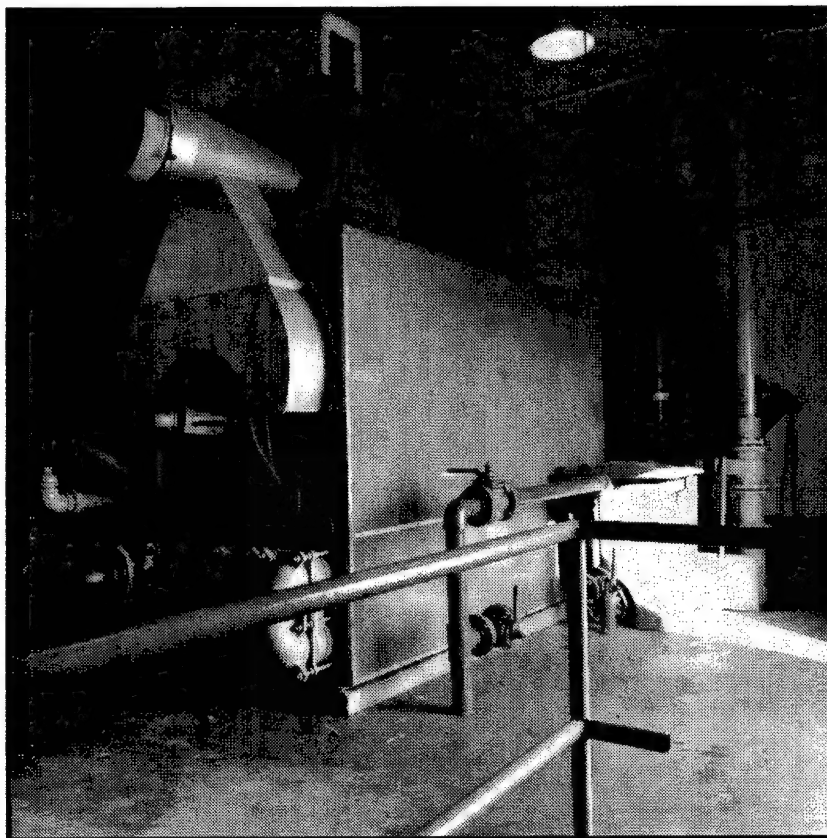


Figure II-36. Interior of Digester Control Room 3862. View of Digester's Modern Water Boiler. Roll HH14, Exposure 5.

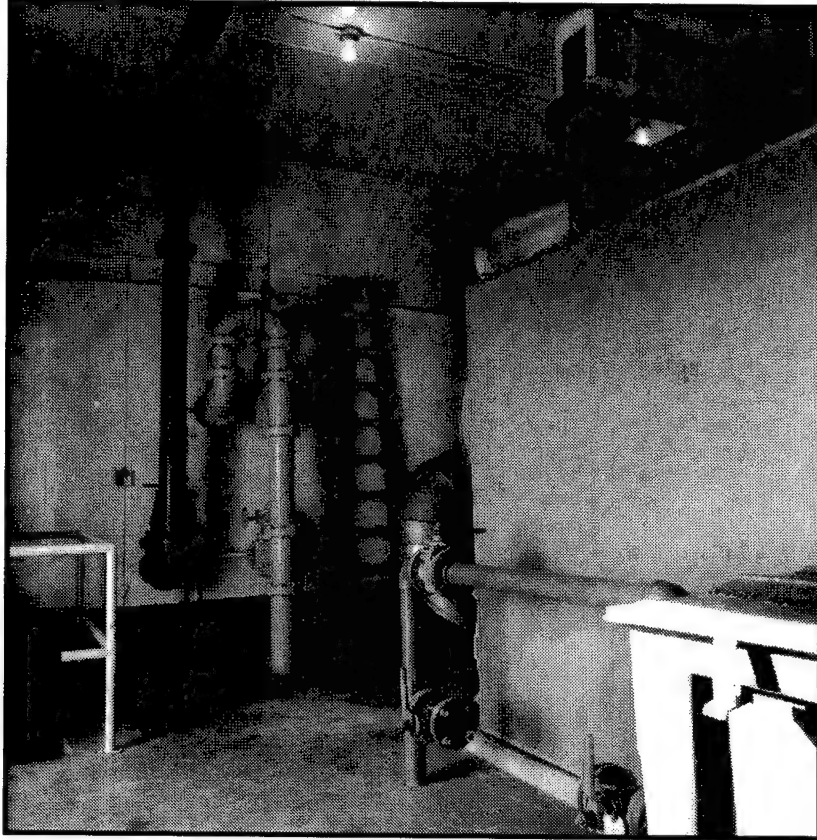


Figure II-37. Interior of Digester Control Room 3862. View to the East. Roll HH14, Exposure 7.

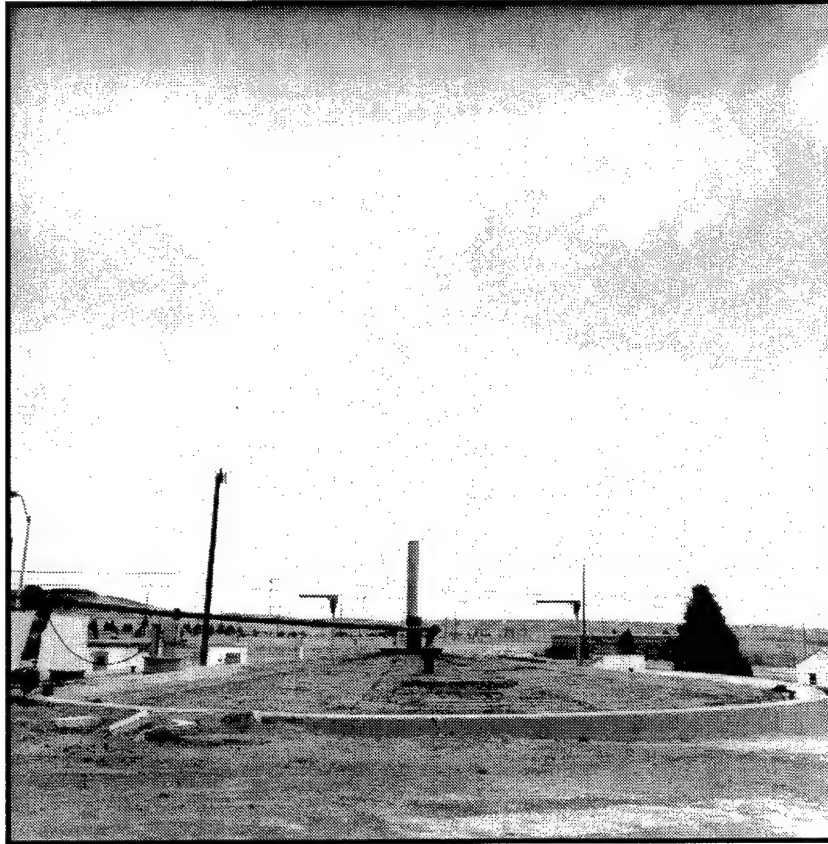


Figure II-38. View of Floating Roof on Secondary Digester 3863. View to the Northeast. Roll HH12, Exposure 5.

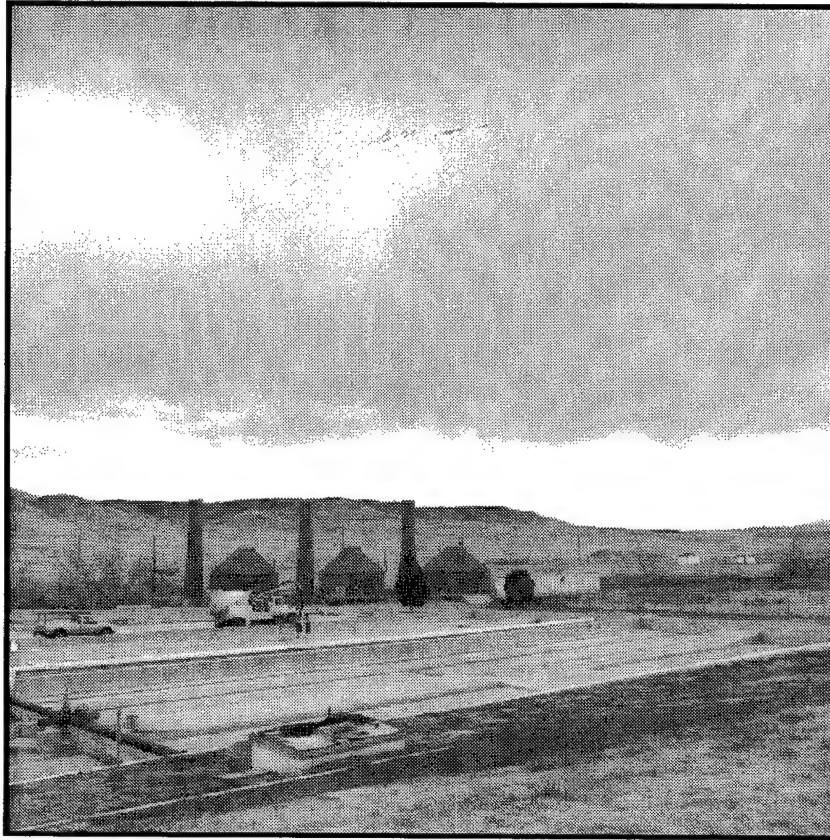


Figure II-39. View of West Half of Sludge Beds 3864, 3865, and 3866. View to the Southwest. Sludge Valve Pit in Foreground. Inlet Pipes to Left. Roll HH13, Exposure 2.

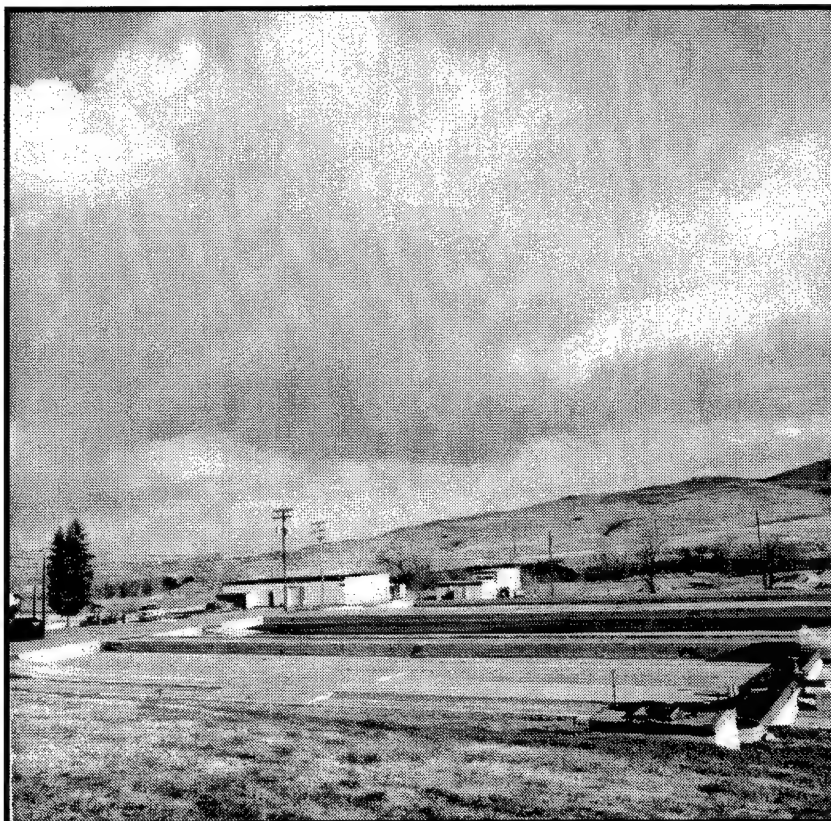


Figure II-40. View of East Half of Sludge Beds 3864, 3865, and 3866. Looking Southeast. Sludge Valve in Foreground, Inlet Pipes to Right. Roll HH13, Exposure 4.

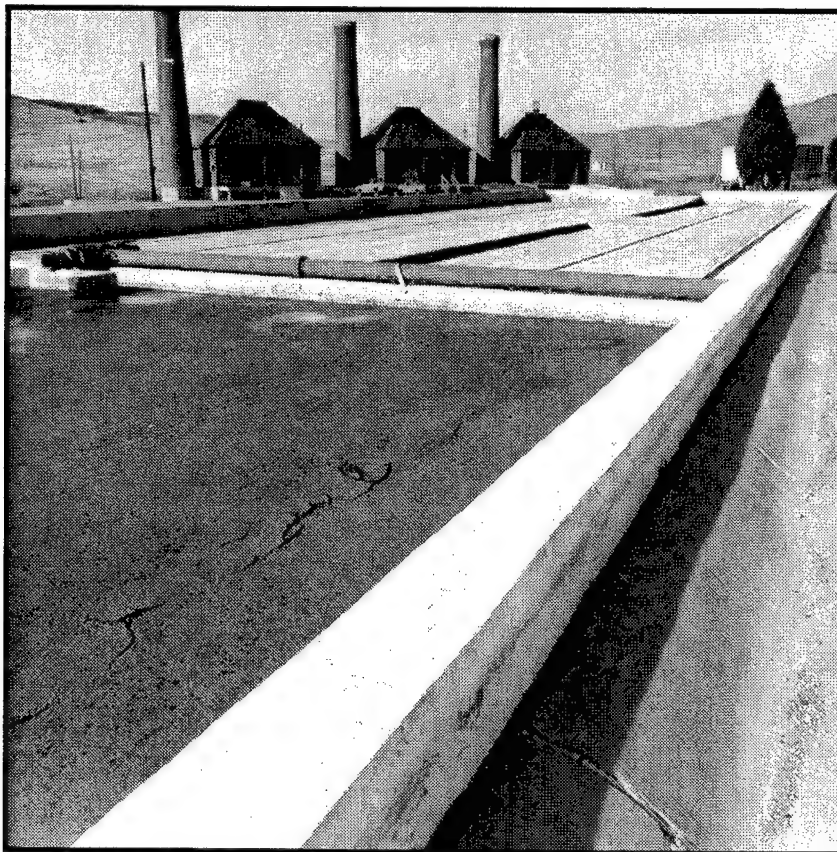


Figure II-41. View of Typical Sludge Drying Operation at Sludge Bed 3866. Note Concrete Floor and Drainage Cuts in Far, Empty Half. Fill Pipe Separates Halves. Roll HH14, Exposure 9.

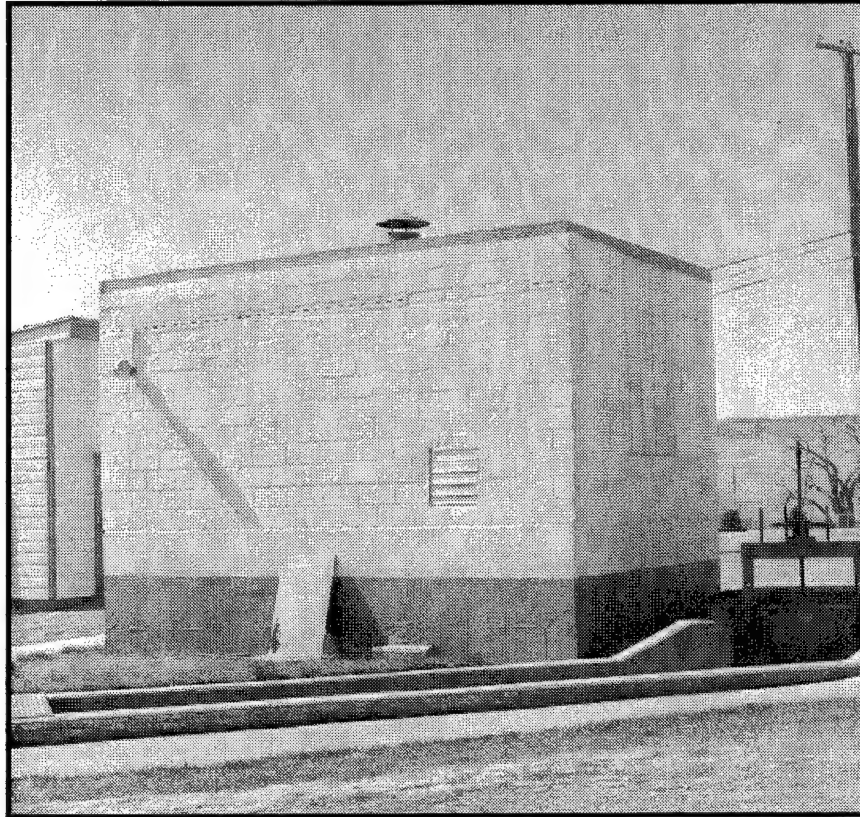


Figure II-42. 3/4 View of Northeast and Northwest Faces of Screen House 3870. Bypass Channel to Right in Foreground and Standby Generator Building 3873 in Background. Roll HH7, Exposure 10.



Figure II-43. View of Northwest and Southeast Faces of Screen House 3870. Roll HH8, Exposure 5.

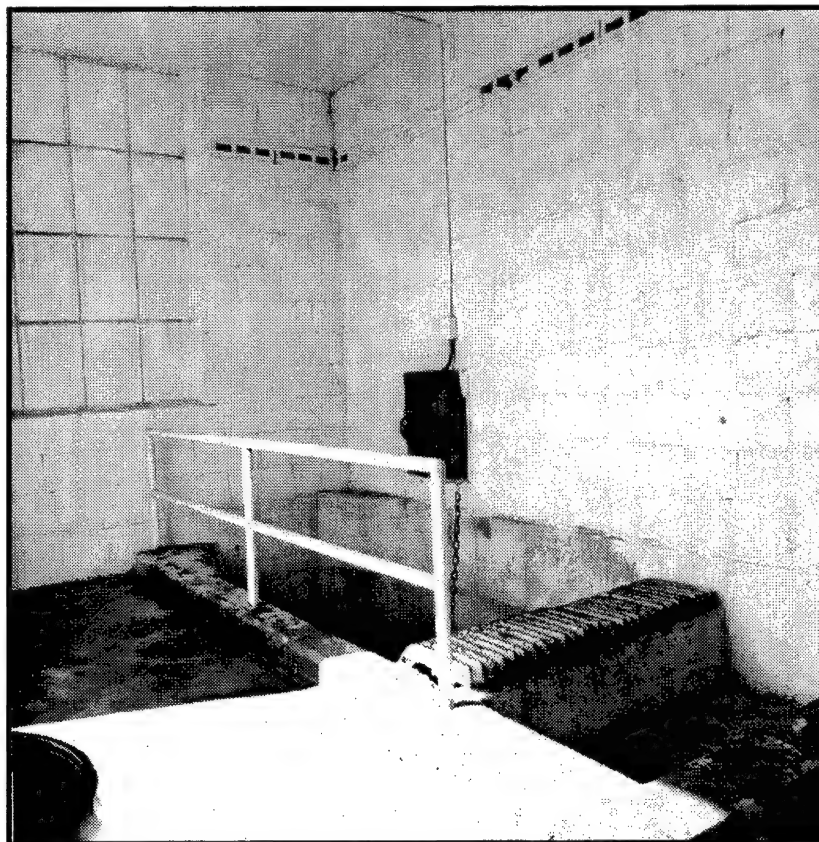


Figure II-44. Interior View of Screen House 3870. Screen and Screen Pit in Corner. Roll HH11, Exposure 4.

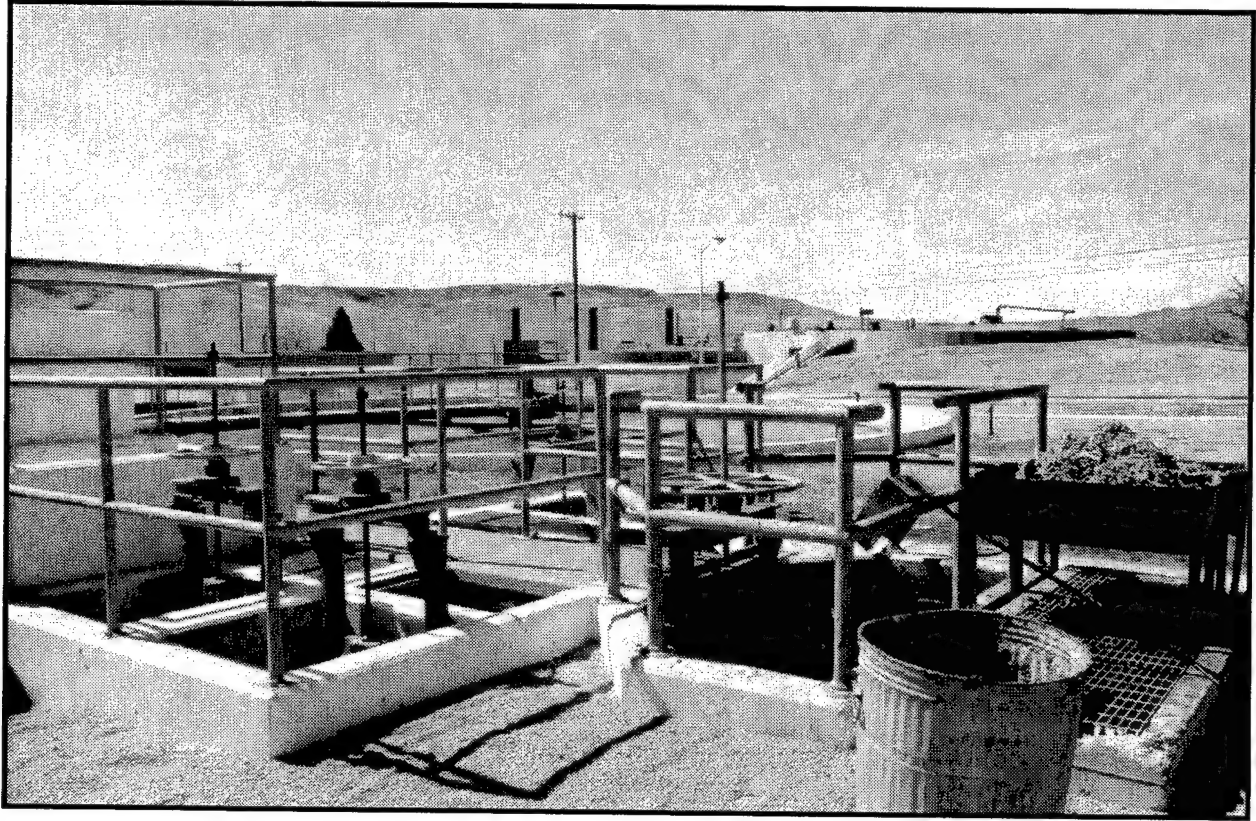


Figure II-45. View of Diversion Box 3875 Looking Southwest. Original Six-Sided Box to Right. Roll MWAC1, Exposure 13.

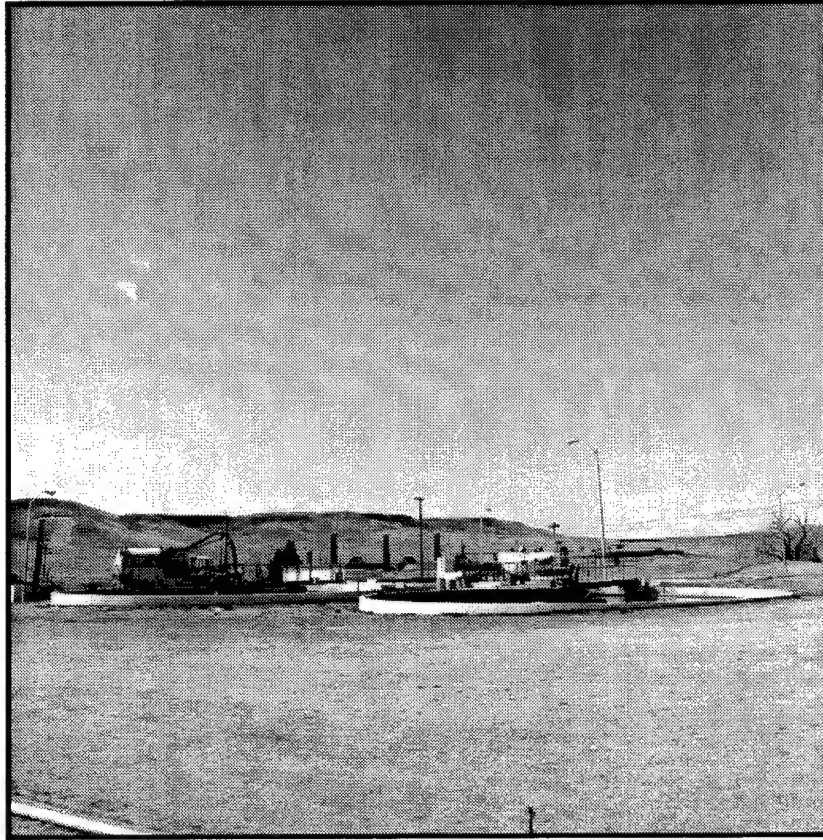


Figure II-46. View of Primary Clarifiers 3876, 3877, and 3879 to the South. Roll HH24, Exposure 7.

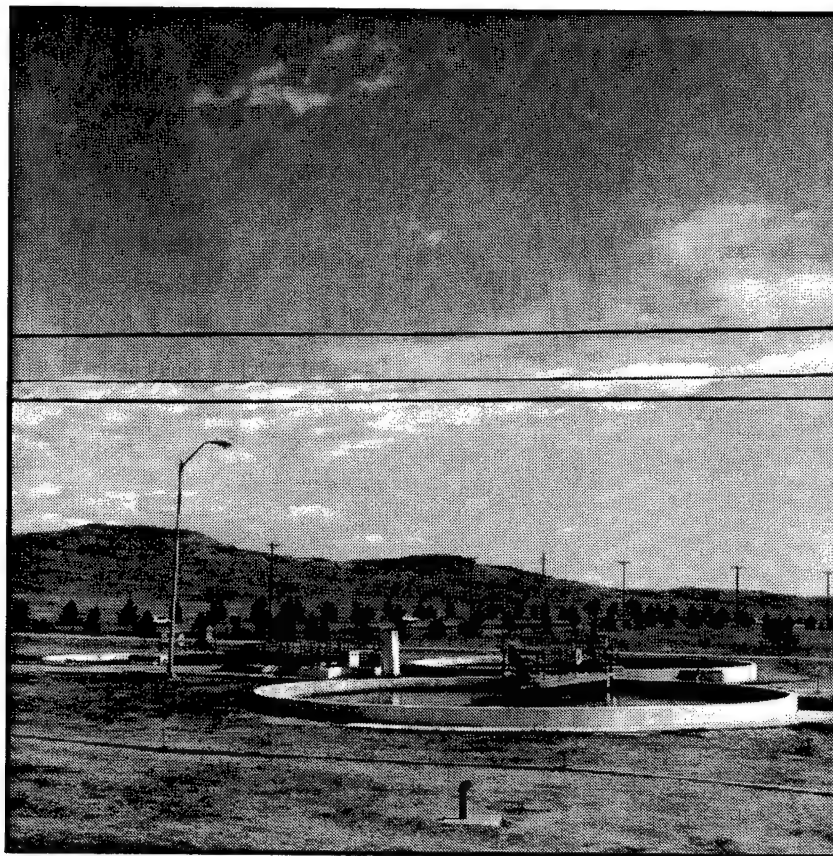


Figure II-47. View of Primary Clarifiers 3876, 3877, and 3879 to the North. RollHH25, Exposure 3.

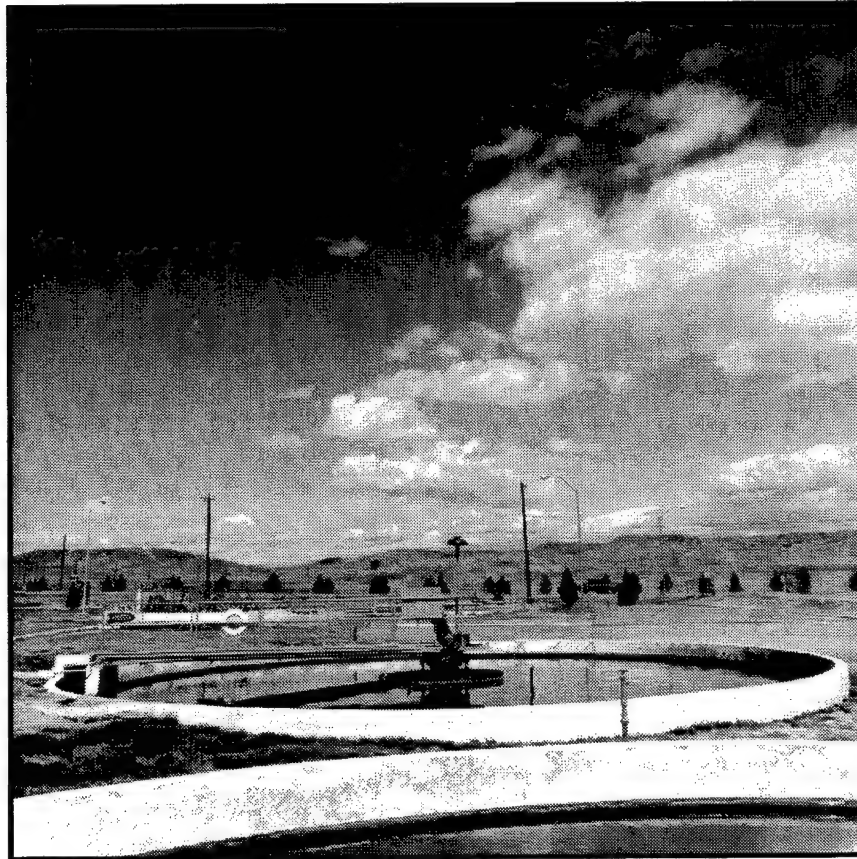


Figure II-48. View of Typical Primary Clarifier Mechanism at Primary Clarifier 3876. Walkway Provides Access Mechanism Motor. View from Clarifier 3886. Roll HH25, Exposure 9.

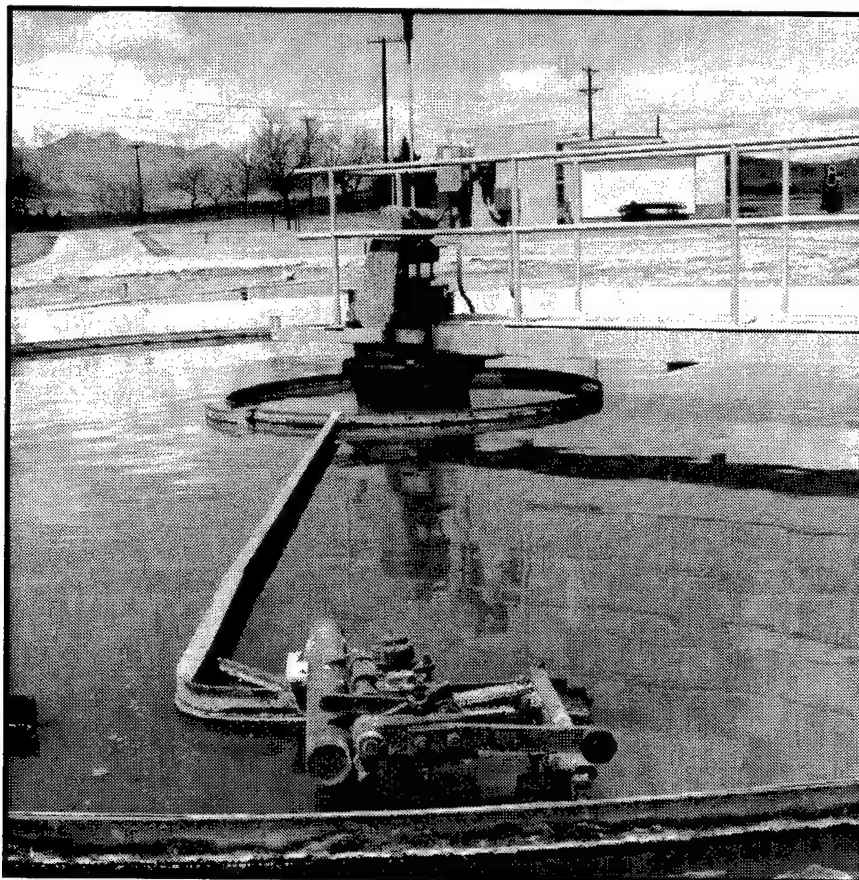


Figure II-49. Detail View of Typical Primary Clarifier Skimmer at Primary Clarifier 3877. Roll HH26, Exposure 2.

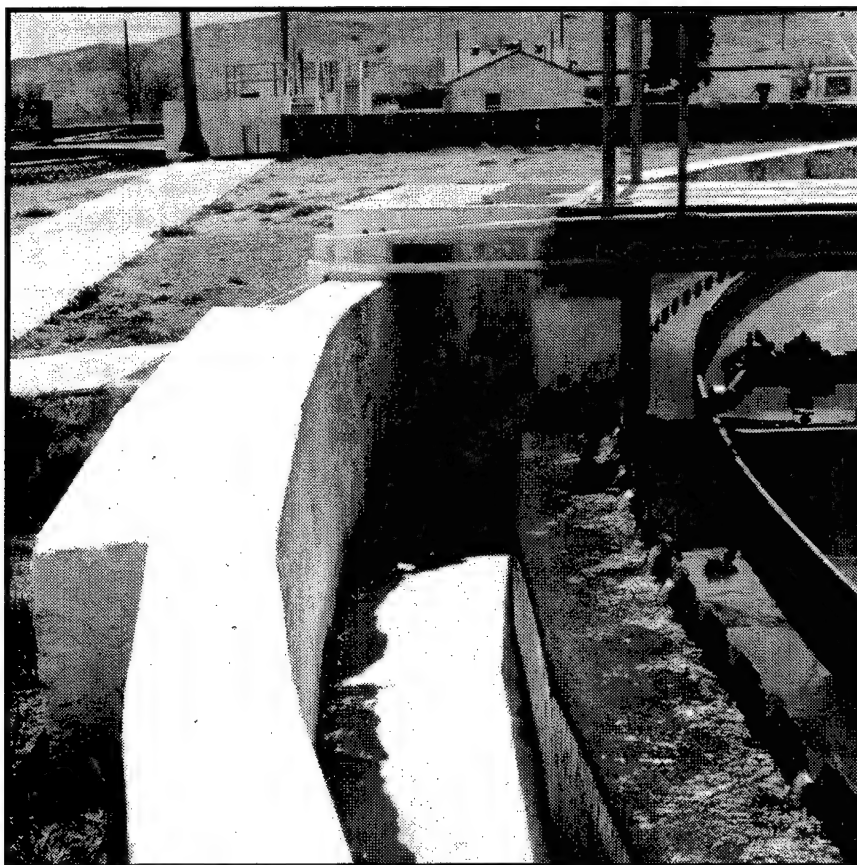


Figure II-50. Detail View of Typical Primary Clarifier Effluent Drain, Weir Plate, Skimmer Rail, and Skimmer Mechanism. View from Primary Clarifier 3877. Roll HH26, Exposure 11.

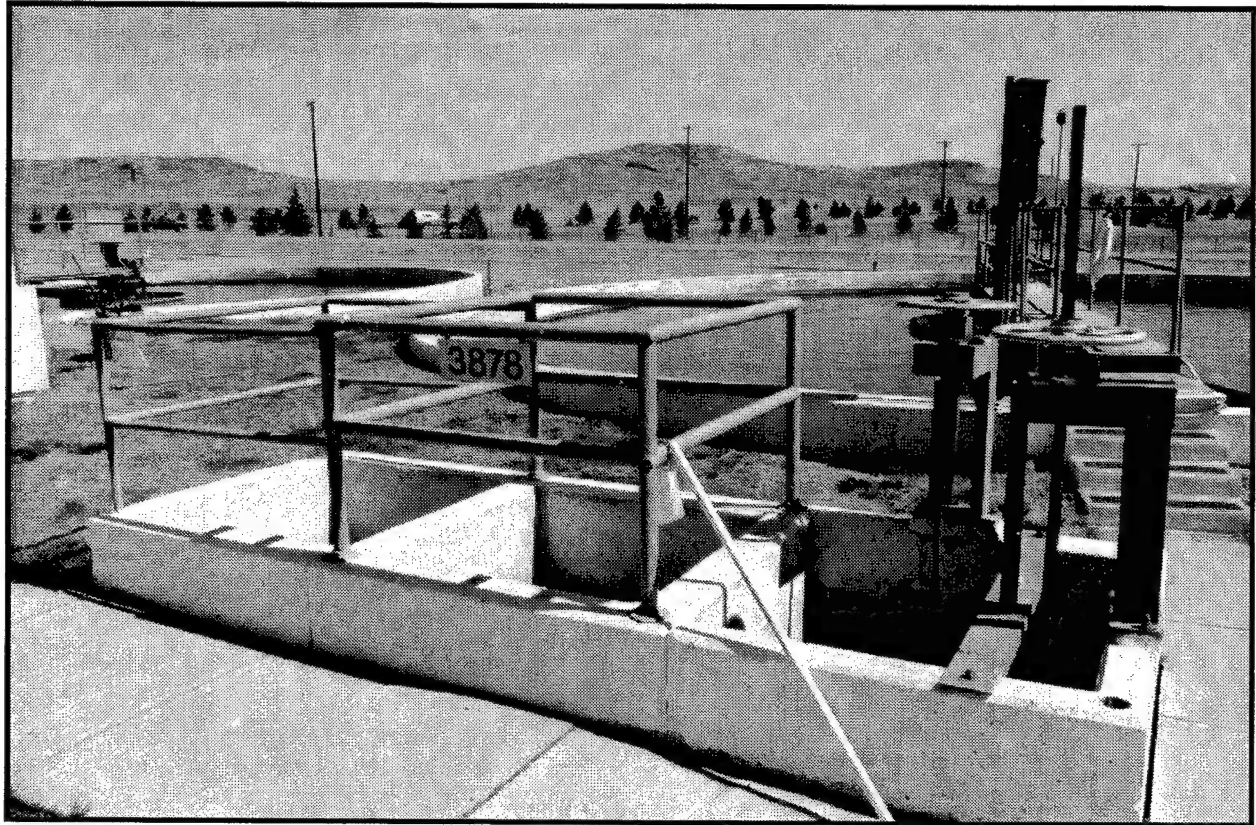


Figure II-51. View of Diversion Box 3878 to the North. Original Construction at Center Flanked by Modifications on Both Sides. Roll MWAC1, Exposure 15.



Figure II-52. Detail view of Typical Walkway Nameplate for a Primary Clarifier. Dorr-Oliver Produces Much of WWTP Mechanical Equipment. View of Primary Clarifier 3879. Roll HH26, Exposure 5.

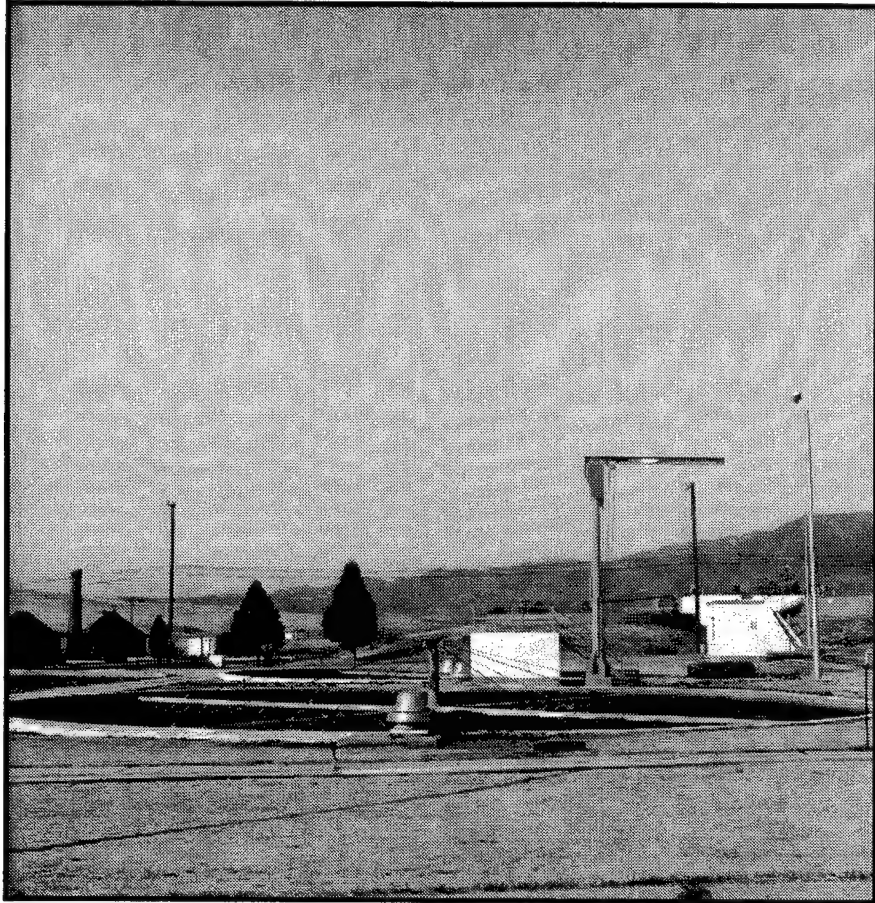


Figure II-53. View of Trickling Filter 3881 Looking Southwest. Rotating Distributor Booms Distribute Waste Water Through Zooglio Mass. Metal Ventilators Aerate Mass. Lawn Irrigation Pipes in Foreground. Roll HH15, Exposure 2.

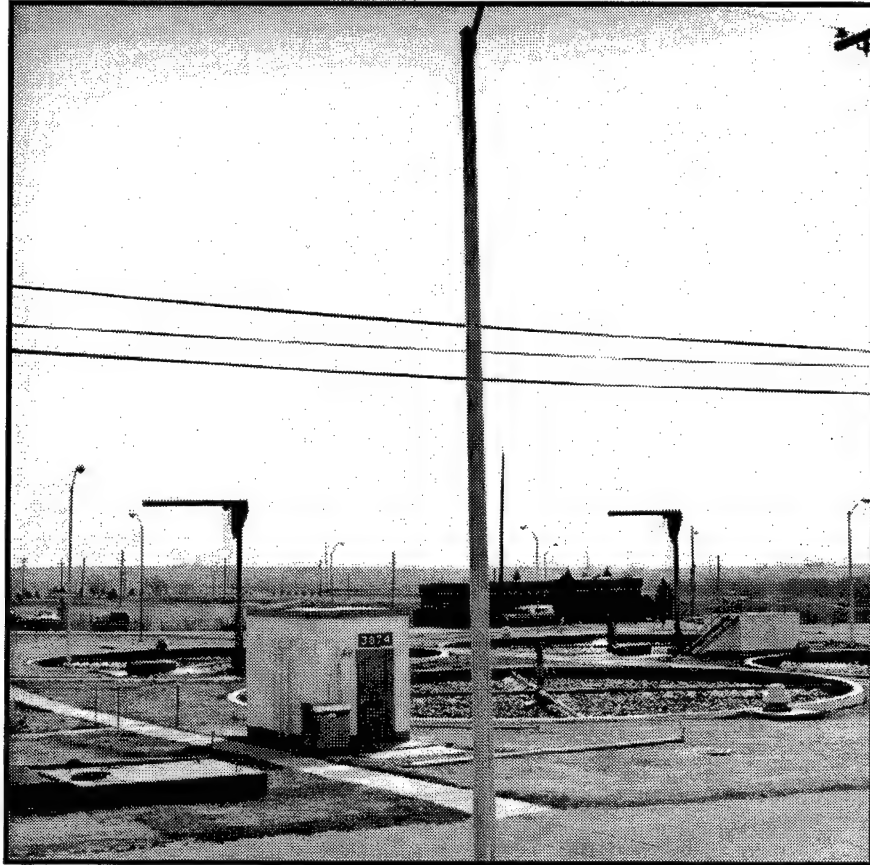


Figure II-54. General View of Trickling Filters 3881, 3883, 3884, and 3886 to the Southeast. Note Filter Head Box 3885 and Cranes. Electrical Power Building 3874 in Foreground. Roll HH15, Exposure 7.

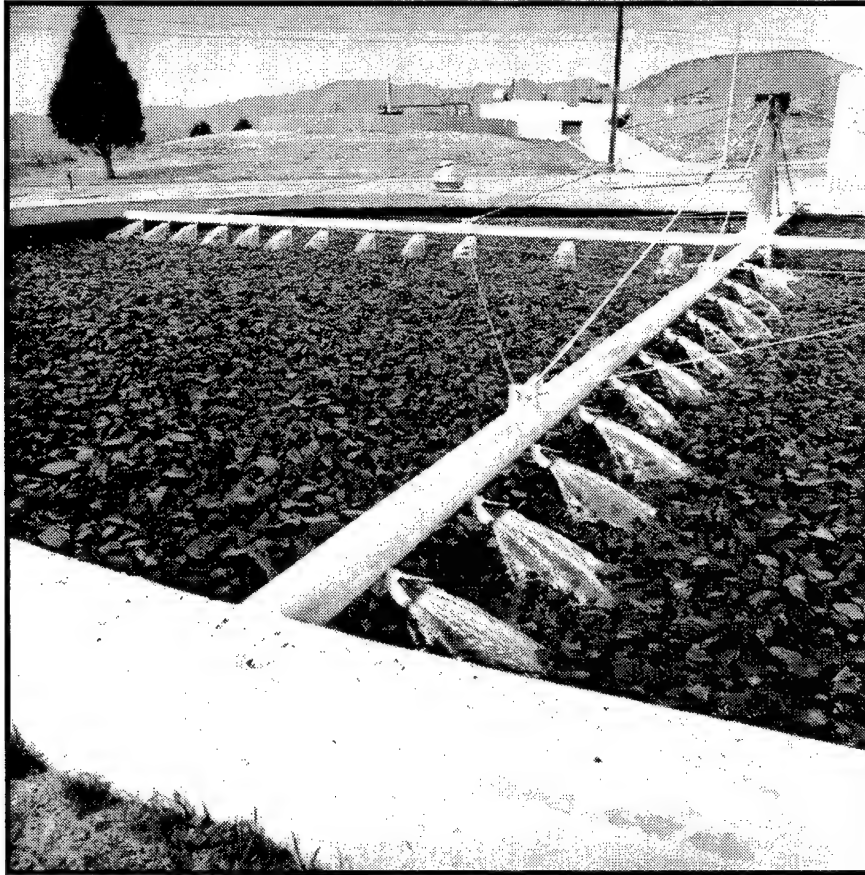


Figure II-55. Detail View of 1981-era Distributor Boom at Trickling Filter 3881. Roll HH16, Exposure 6.

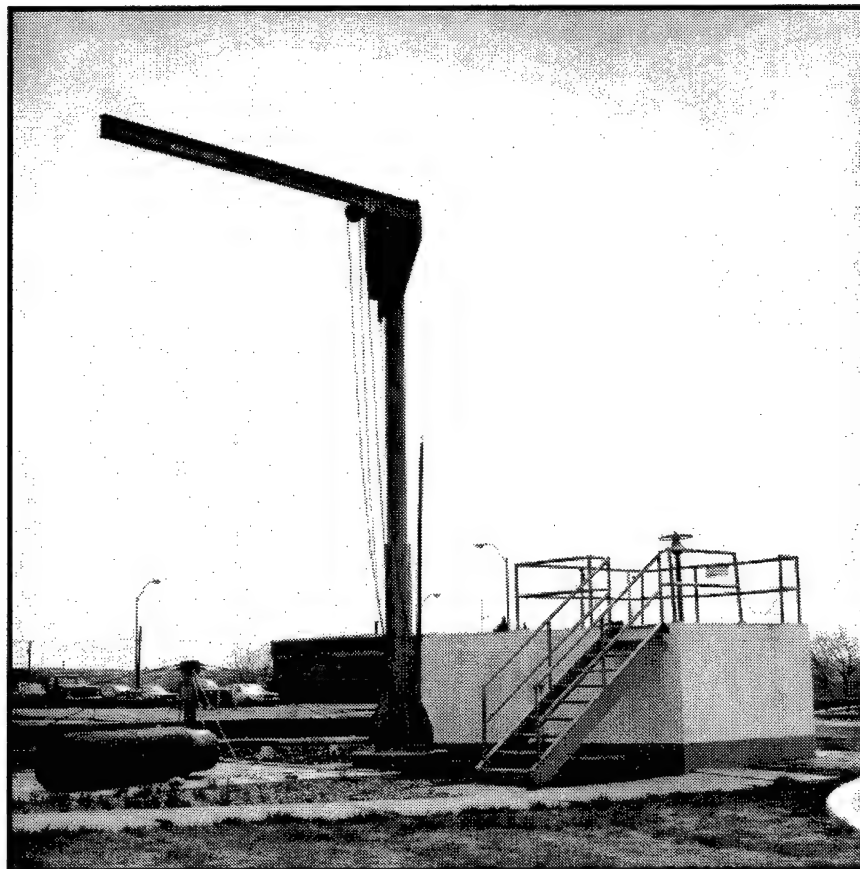


Figure II-56. 3/4 View of Filter Head Box 3882 to the East. Note 1980s-era Filter Head Box Crane. Roll HH16, Exposure 11.



Figure II-57. 3/4 View of Filter Head Box 3885 to the South. Note 1980s-era Filter Head Box Crane. Roll HH18, Exposure 5.

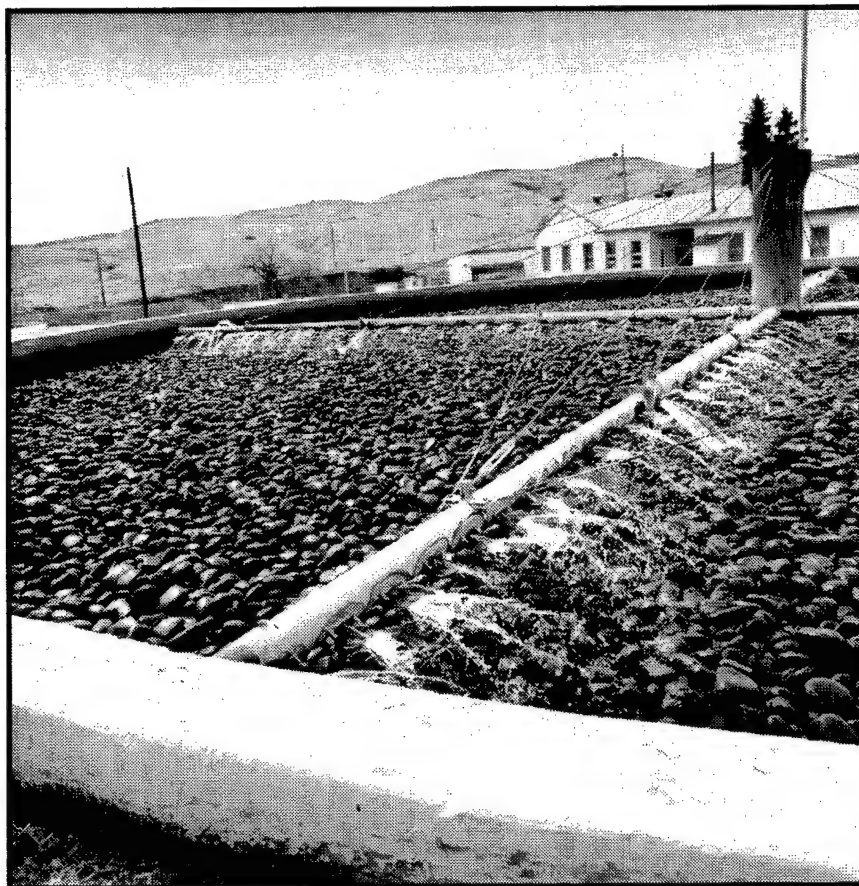


Figure II-58. Detail View of 1980s-era Distributor Boom at Trickling Filter 3886. Distributor Boom Mechanism Typical for Filters 3883, 3884, and 3886. Roll HH18, Exposure 2.

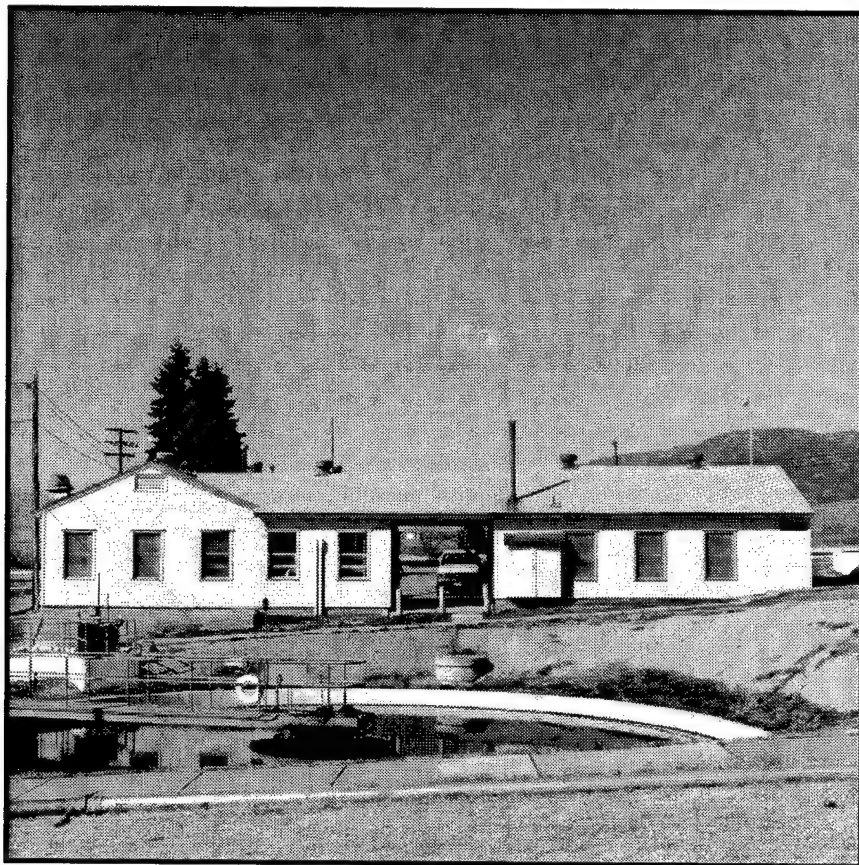


Figure II-59. View of East Face of Laboratory and Control 3887. Covered Drive-through Divides North and South Wings. Secondary Clarifier 3888 in Foreground. Roll HH6, Exposure 6.

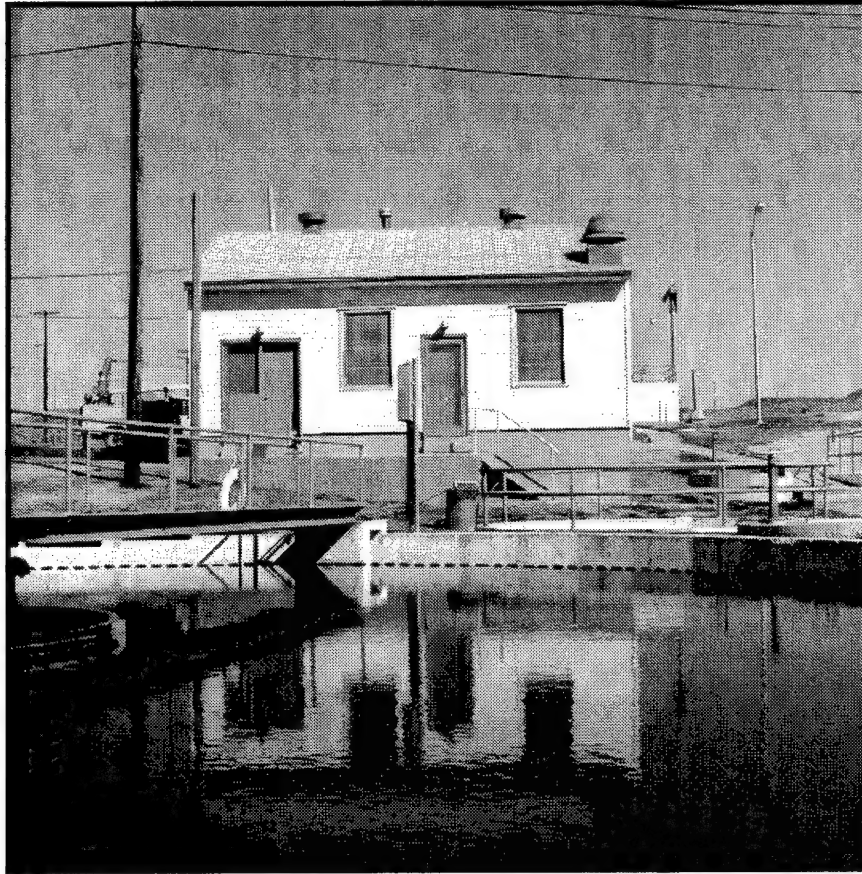


Figure II-60. View of South Face of Laboratory and Control 3887. Roll HH6, Exposure 10.

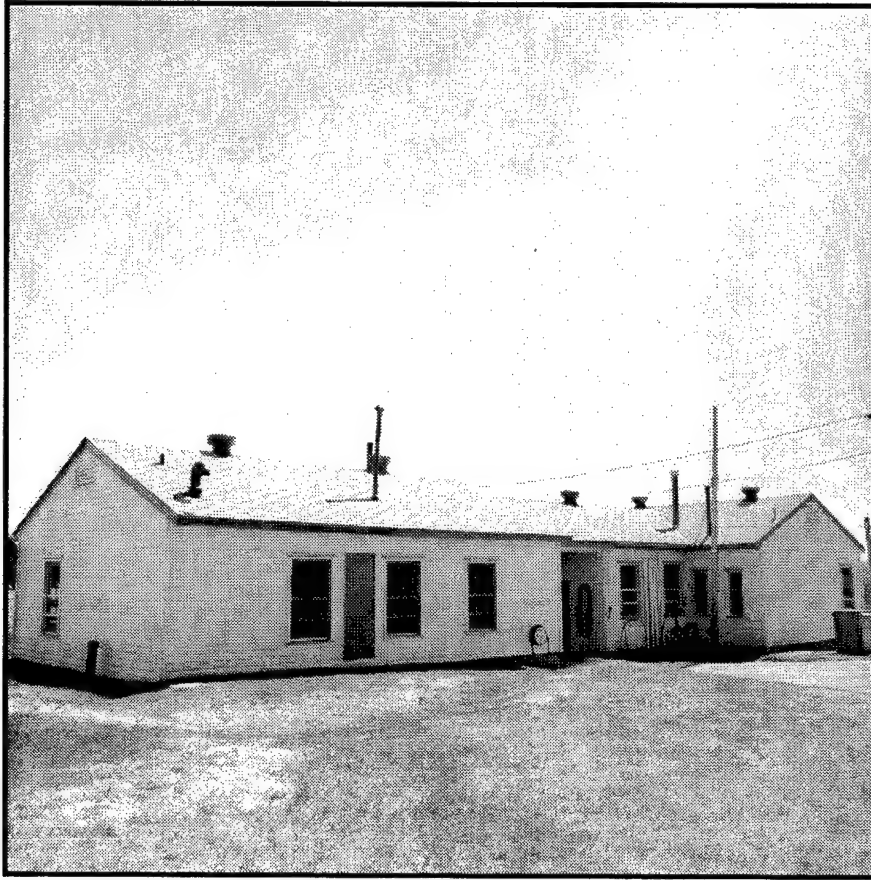


Figure II-61. 3/4 View of Northwest and Southwest Faces of Laboratory and Control 3887. Roll HH8, Exposure 8.

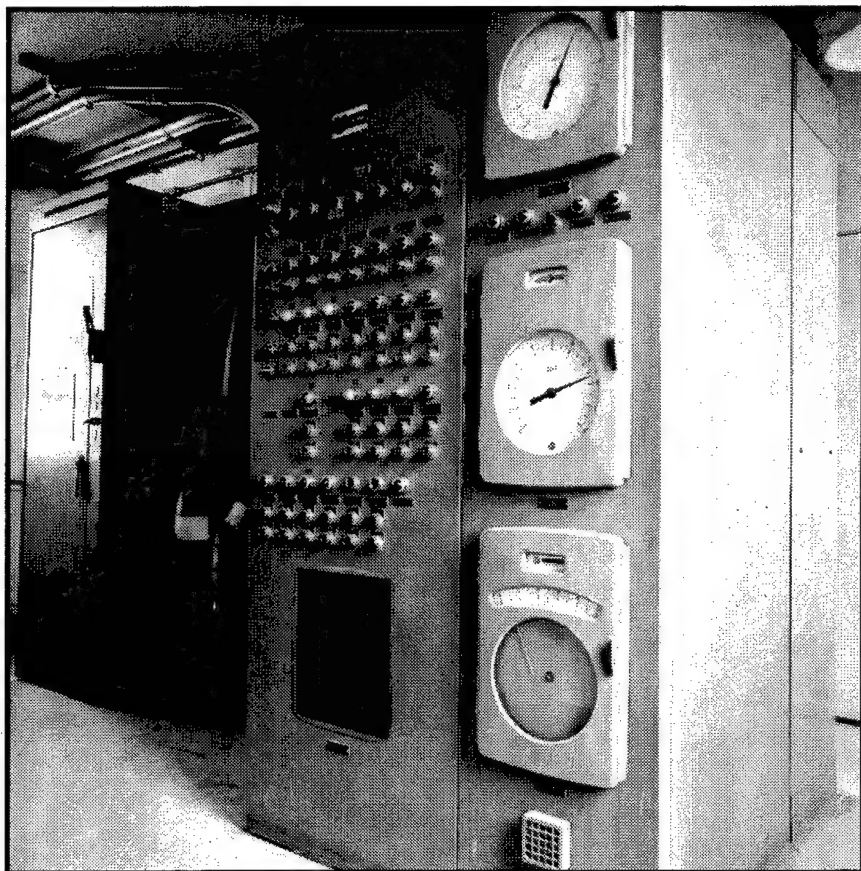


Figure II-62. Interior View of Laboratory and Control 3887. View of Control Panel on Main Floor, South Wing. Roll HH27, Exposure 3.



Figure II-63. Interior View of Laboratory and Control 3887. View of Original Laboratory Room on Main Floor of South Wing. Floor Beneath Modern Crane Opens to Left Secondary Sludge and Recirculation Pump from Basement. Roll HH27, Exposure 5.

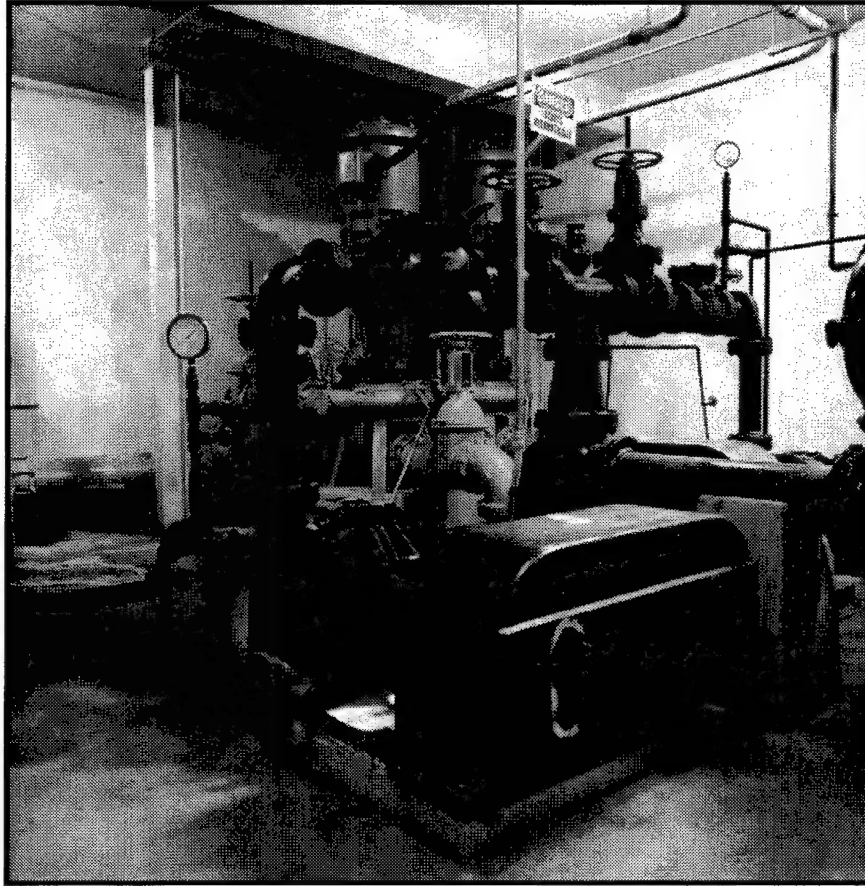


Figure II-64. Interior View of Laboratory and Control 3887. View From Basement in South Wing of Secondary Sludge and Recirculation Pumps. Roll HH27, Exposure 6.

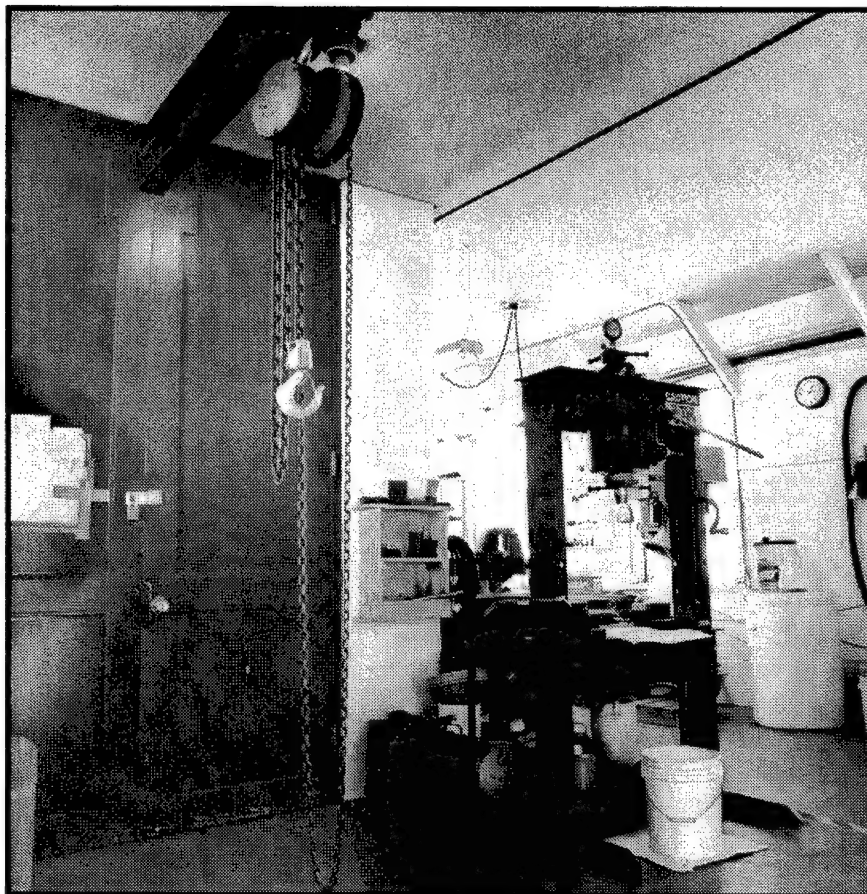


Figure II-65. Interior view of Laboratory and Control 3887. Original Chlorine Storage Room on Main Floor of North Wing (Now Storage Area and Shop). Room to Left is 1961-era Modification. Overhead Traveling Crane Moved Chlorine Tanks. Roll HH27, Exposure 10.

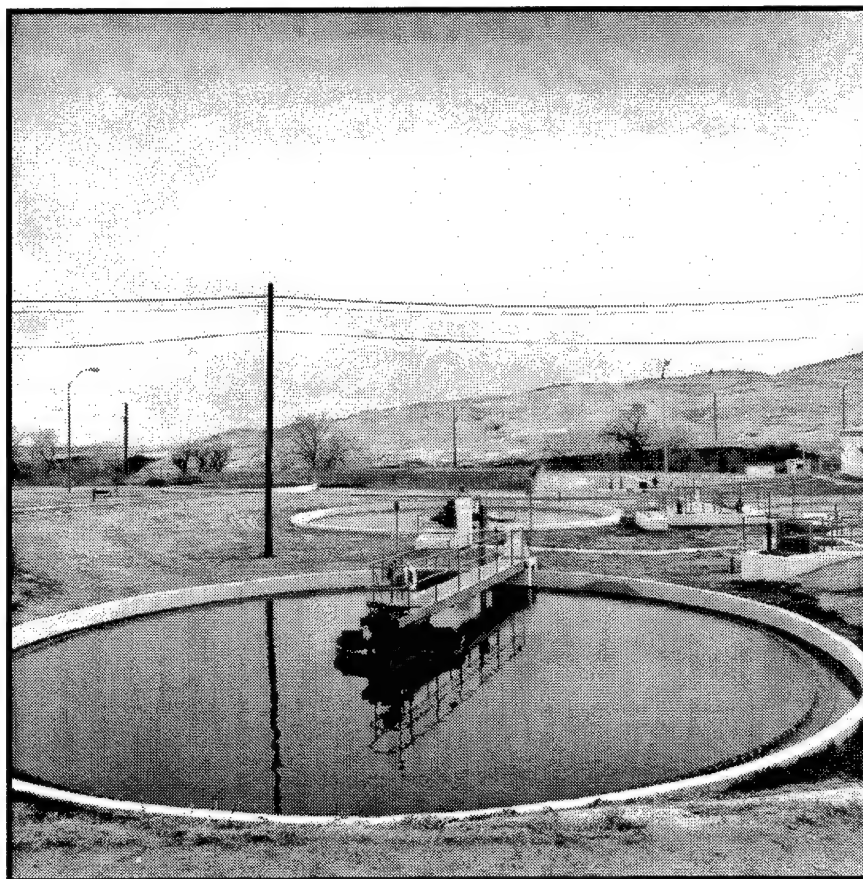


Figure II-66. View of Secondary Clarifier 3888 to the Southeast. Diversion Box 3890 to right in Background. Roll HH19, Exposure 4.

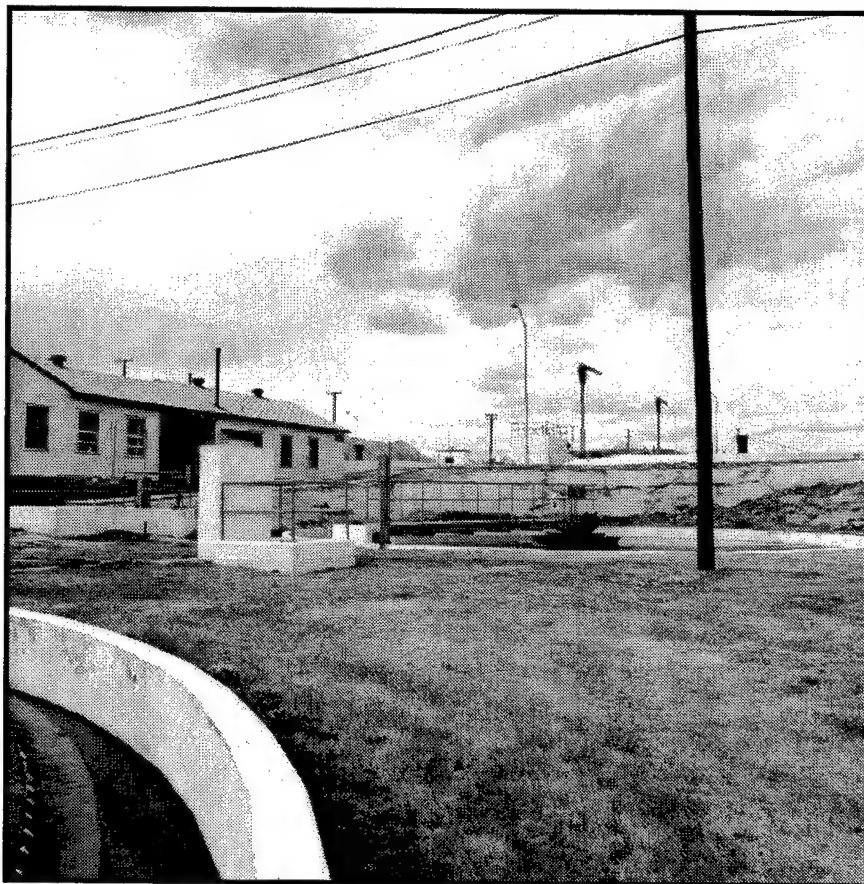


Figure II-67. View of Unnamed Abandoned Flow Box. This Open Structure Sits Over the Exposed Channel Carrying Effluent From Secondary Clarifier 3888 to Diversion Box 3891. Roll HH19, Exposure 8.

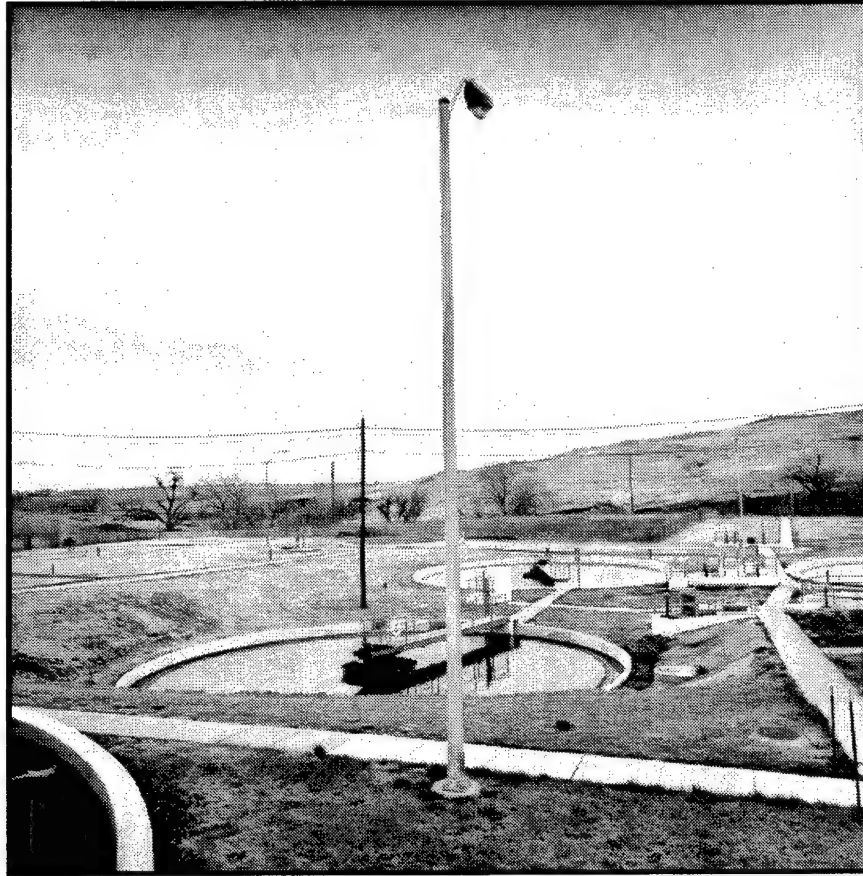


Figure II-68. General View of Secondary Clarifiers 3888, 3895, and 3892 and Diversion Boxes 3890, 3891, and 3893. View from Filter Head Box 3885 to the South. Roll HH20, Exposure 2.

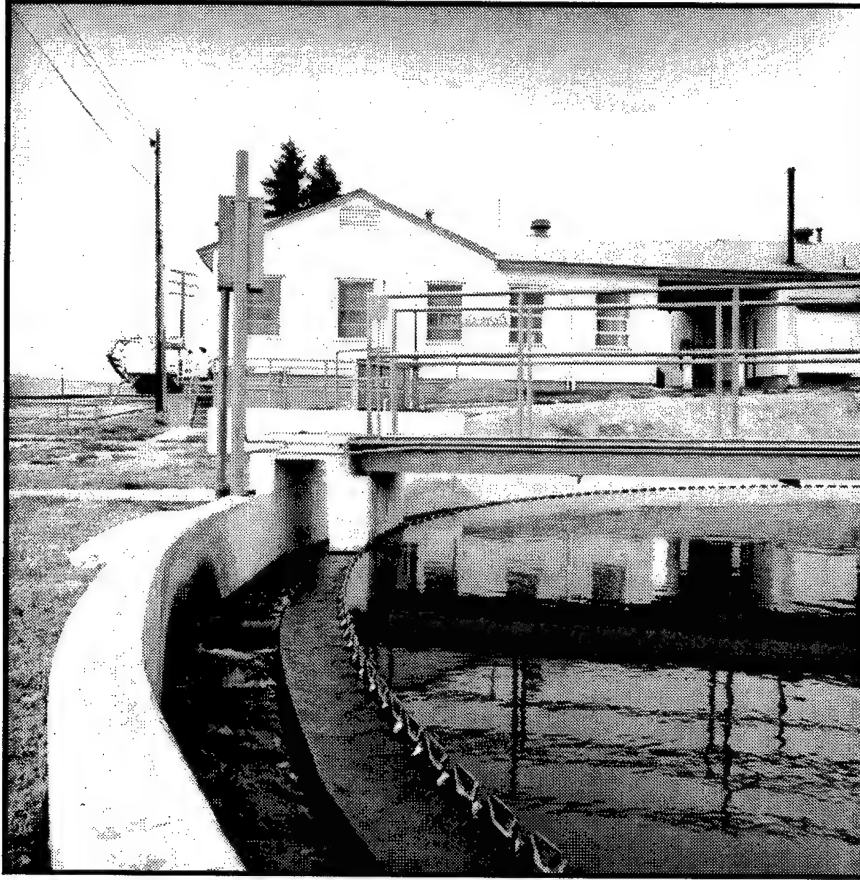


Figure II-69. Detail View of Typical Secondary Clarifier Weir Plate, Effluent Drain, and Walkway. View of Secondary Clarifier 3888. Roll HH20, Exposure 6.

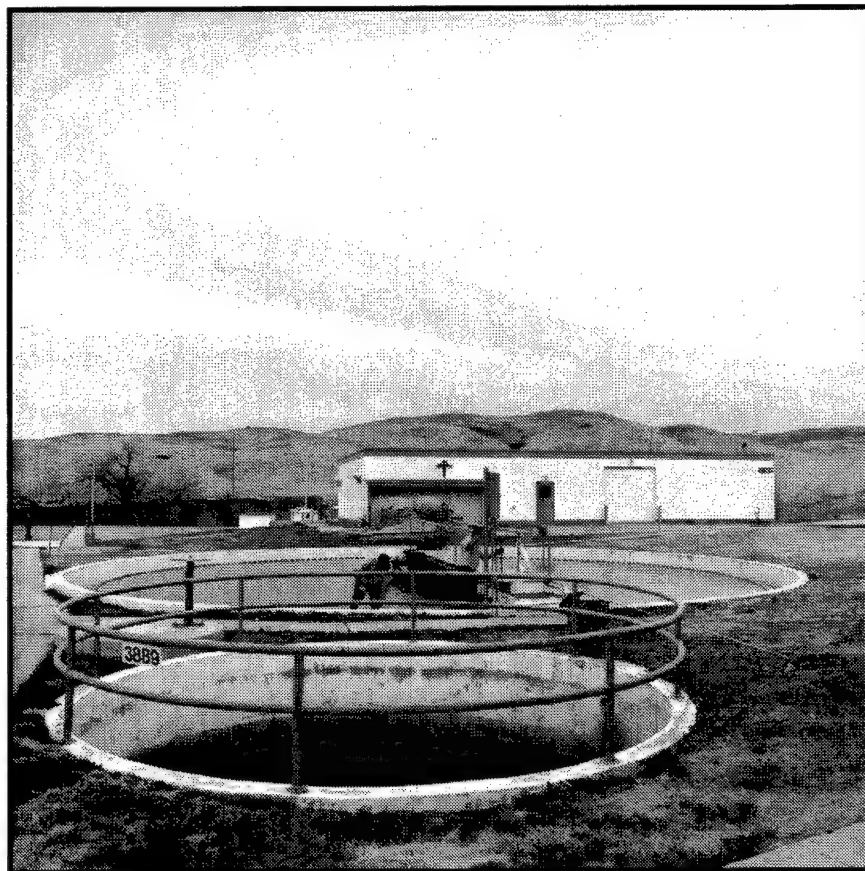


Figure II-70. View of Recirculation Well 3889 to the Southeast. Secondary Clarifier 3892 in Background. Roll HH23, Exposure 6.

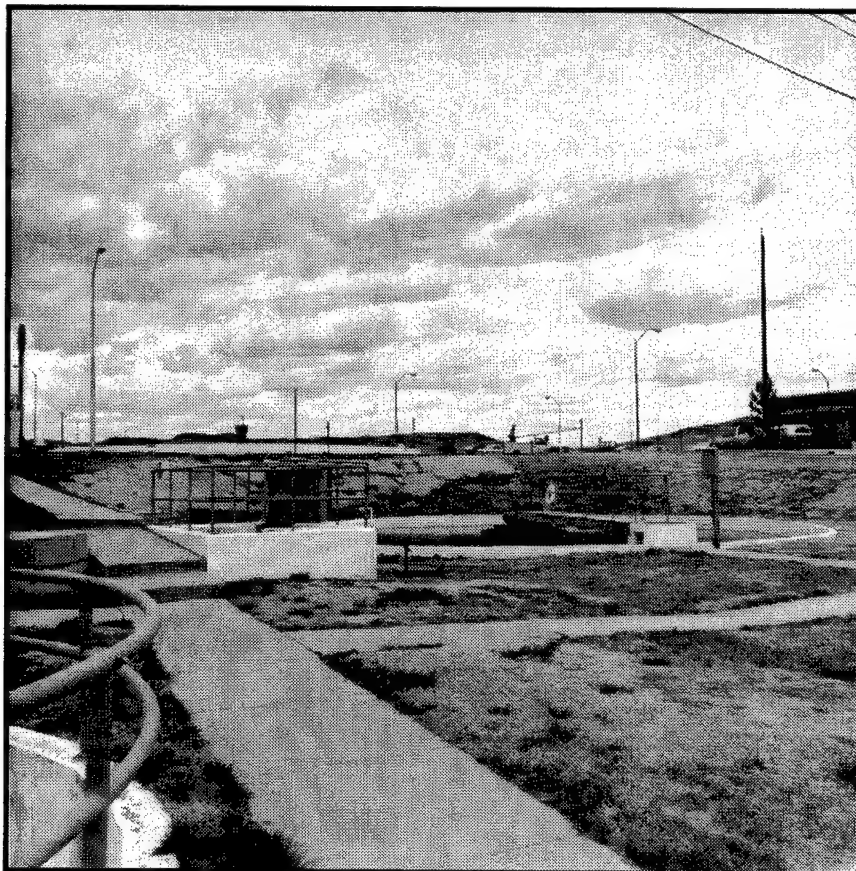


Figure II-71. View of Diversion Box 3890 to the North. Recirculation Well 3889 to Left in Foreground. Roll HH20, Exposure 5.

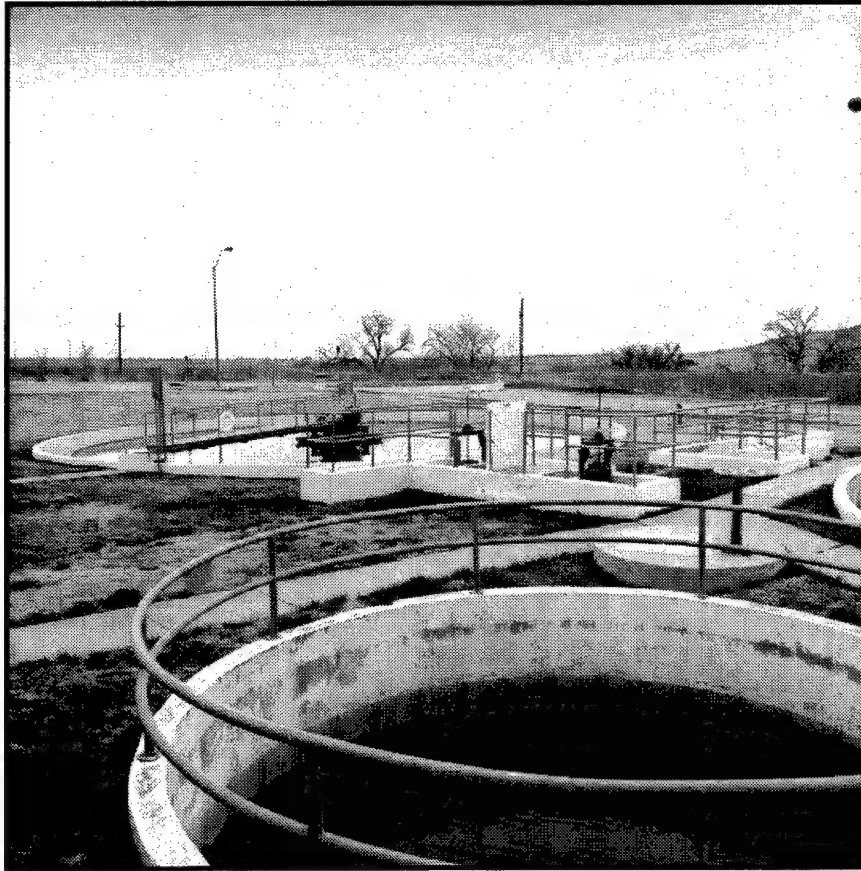


Figure II-72. View of Diversion Box 3891 to the East. Recirculation Well 3889 in Foreground. Diversion Box/Parshall Flume 3893 to Right in Background. Roll HH20, Exposure 11.

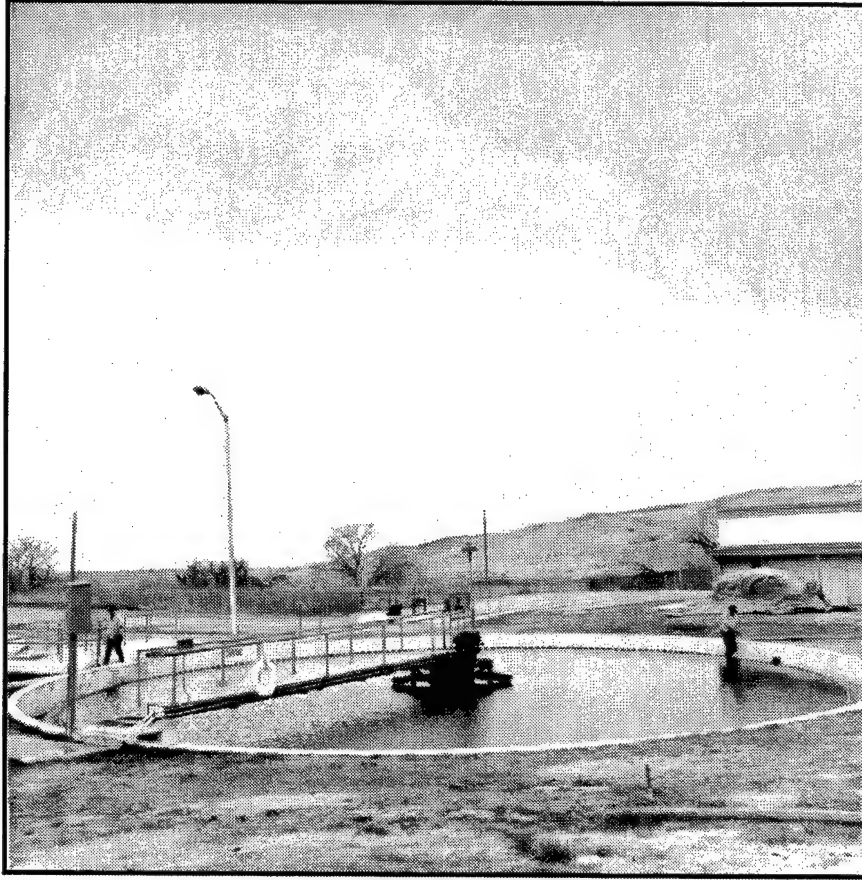


Figure II-73. View of Secondary Clarifier 3892 to the East. Roll HH23, Exposure 9.

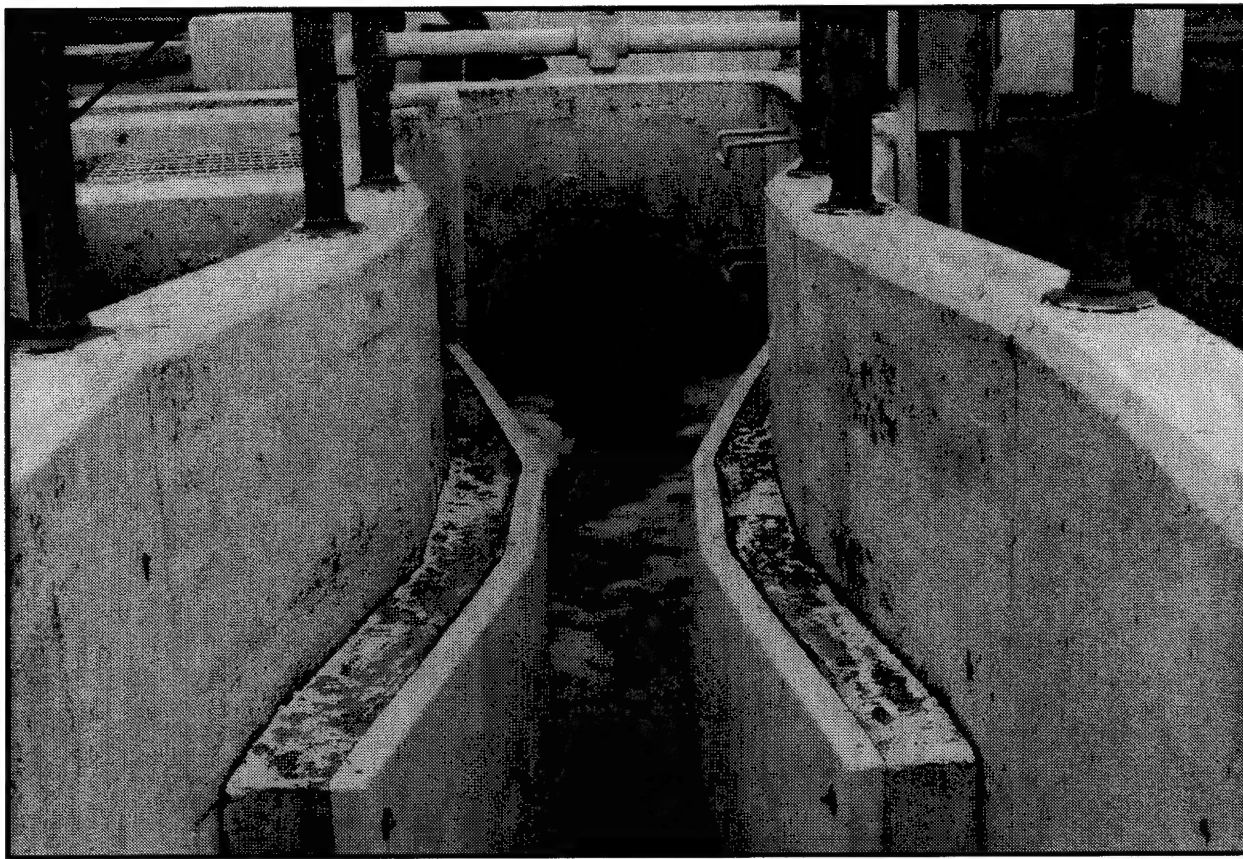


Figure II-74. View of Diversion Box/Parshall Flume 3893. View Upstream Through Flume. Note 1981-era Modification That Narrowed Flume. Roll MWAC3, Exposure 21.

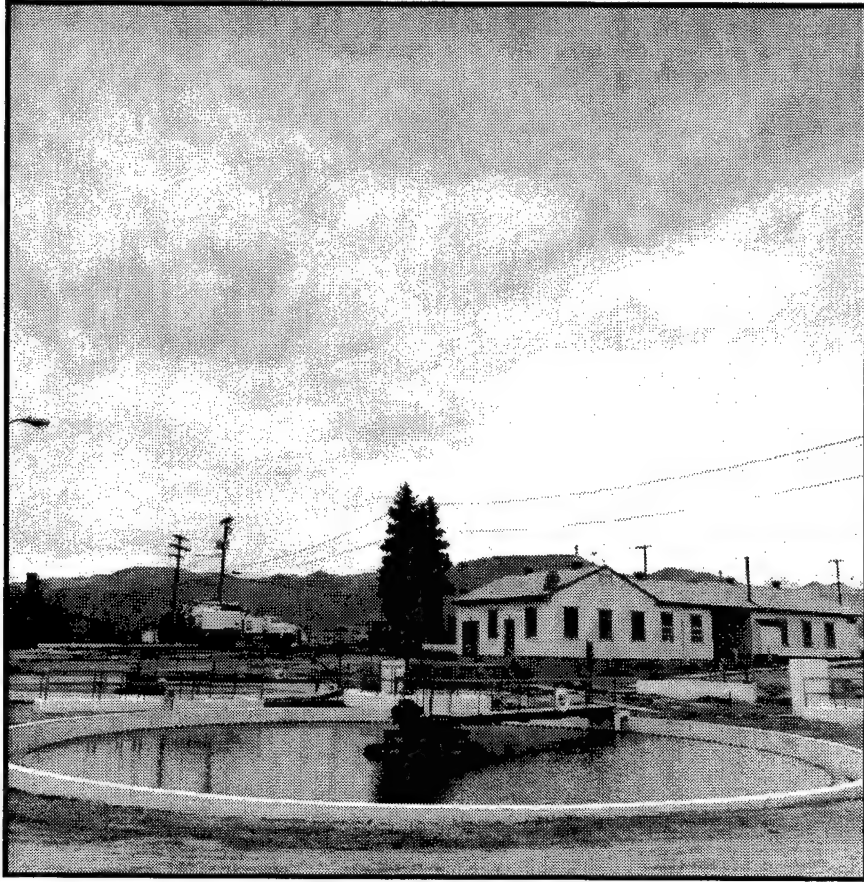


Figure II-75. View of Secondary Clarifier 3895 to the West. Diversion Boxes 3890, 3891, and 3893 Visible in Background. Roll HH21, Exposure 9.

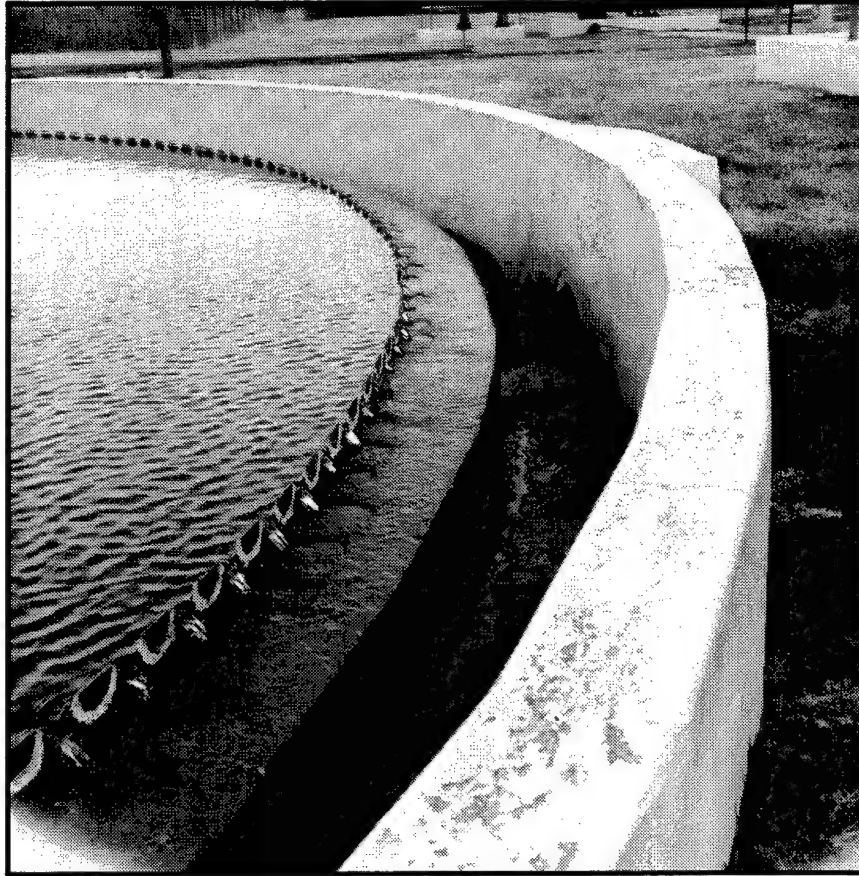


Figure II-76. Detail View of Typical Secondary Clarifier Weir Plate and Effluent Drain. View of Secondary Clarifier 3895. Roll HH22, Exposure 5.



Figure II-77. View of Effluent Outfall at Clover Ditch to the Northeast. Outfall's Method of Constuction Suggests It Dates From 1980s. Roll MWAC3, Exposure 24.

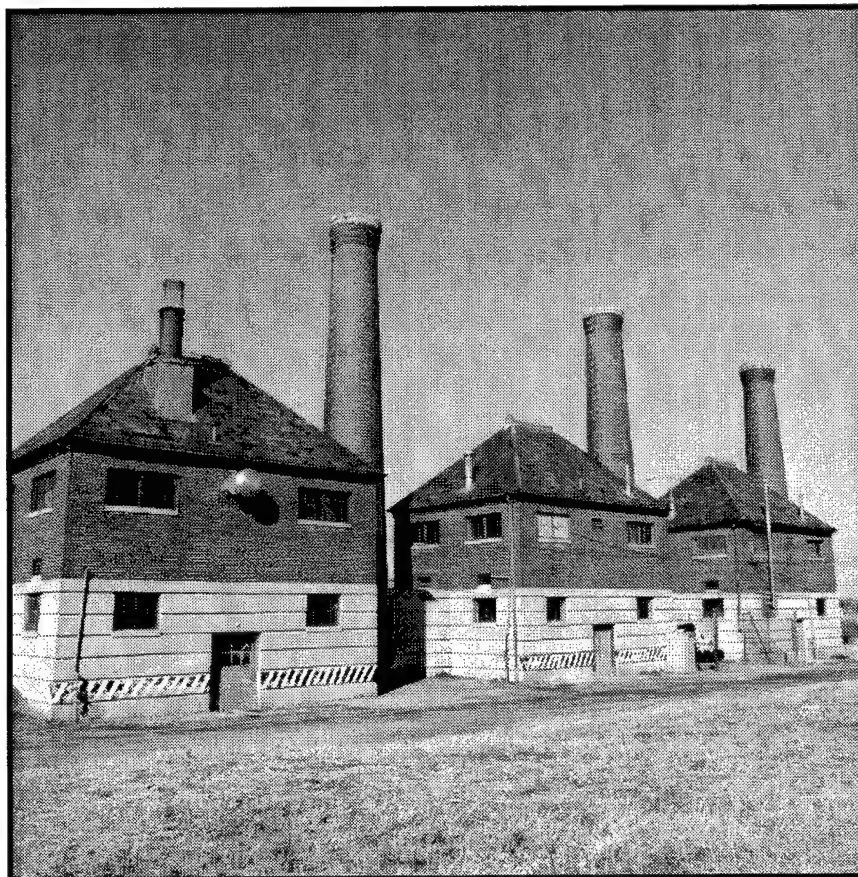


Figure II-78. General View of Incinerators 3850, 3851, and 3852 to the Northeast.
Roll HH2, Exposure 6.

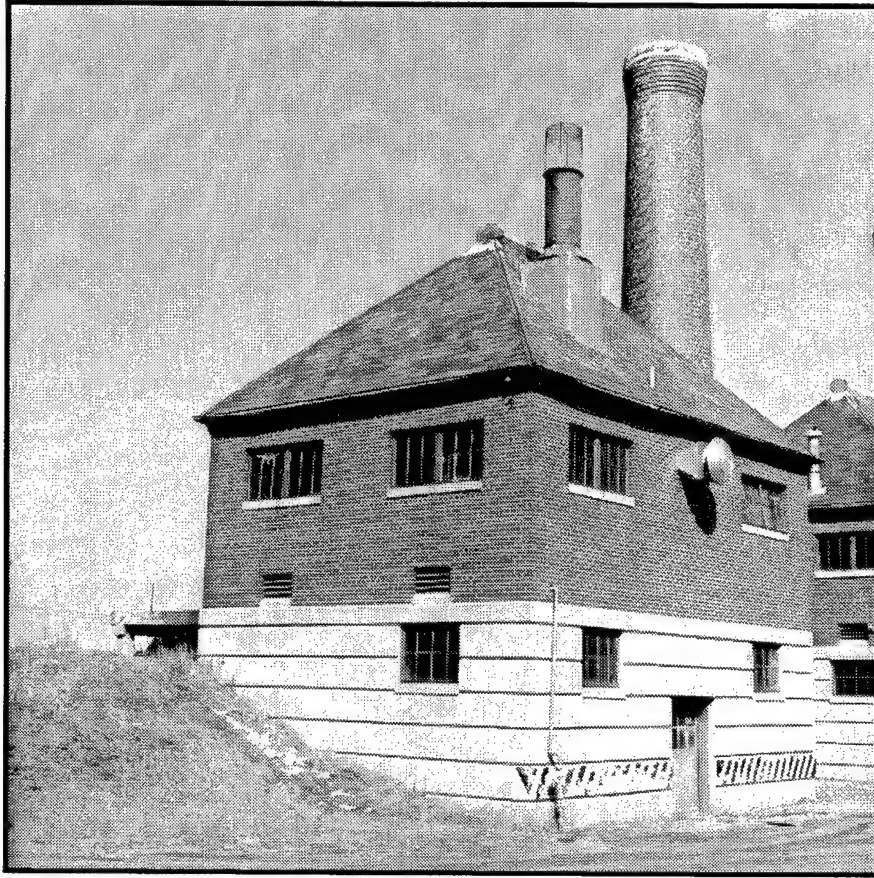


Figure II-79. 3/4 View of South and West Faces of Incinerator 3850. Roll HH1, Exposure 4.

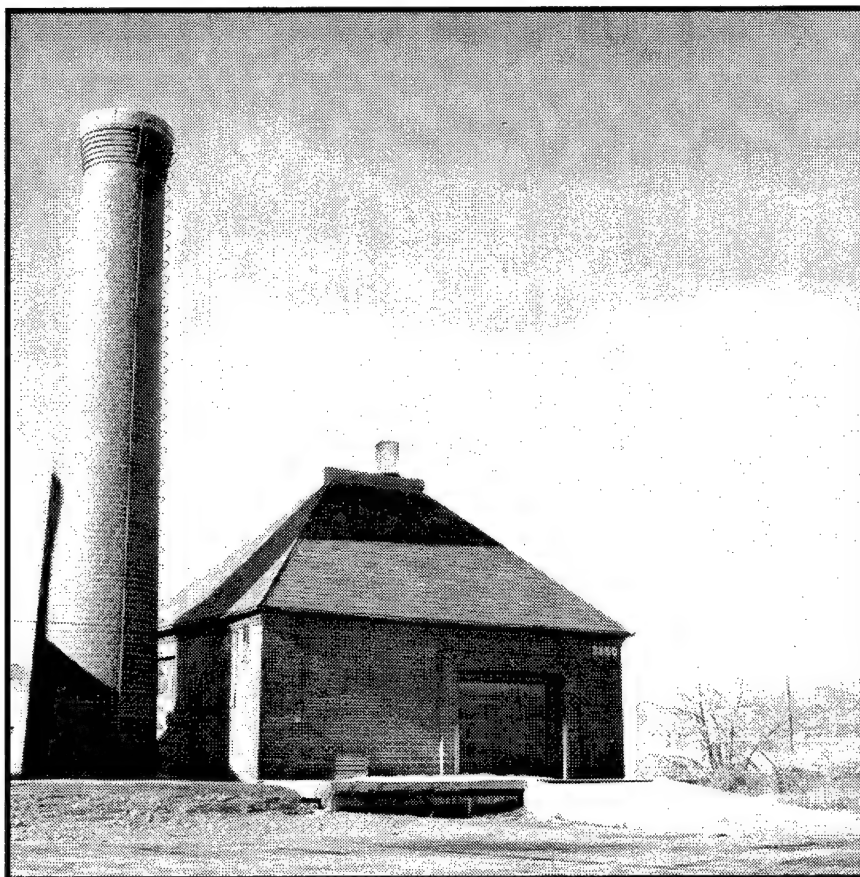


Figure II-80. 3/4 View of North and East Faces of Incinerator 3850. Loading Dock and Ramp in Foreground, Associated Chimney to Left. Roll HH3, Exposure 6.

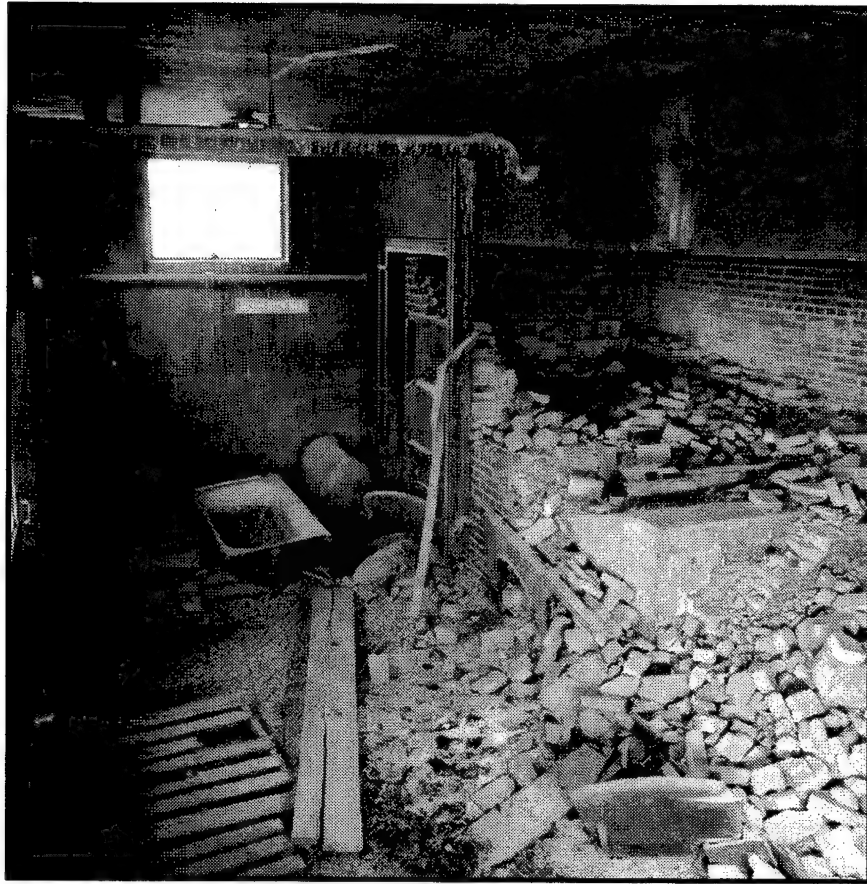


Figure II-81. Interior View of Basement at Incinerator 3850. View to the West. Brick Remains of Incinerators Visible to Right. Roll HH4, Exposure 6.

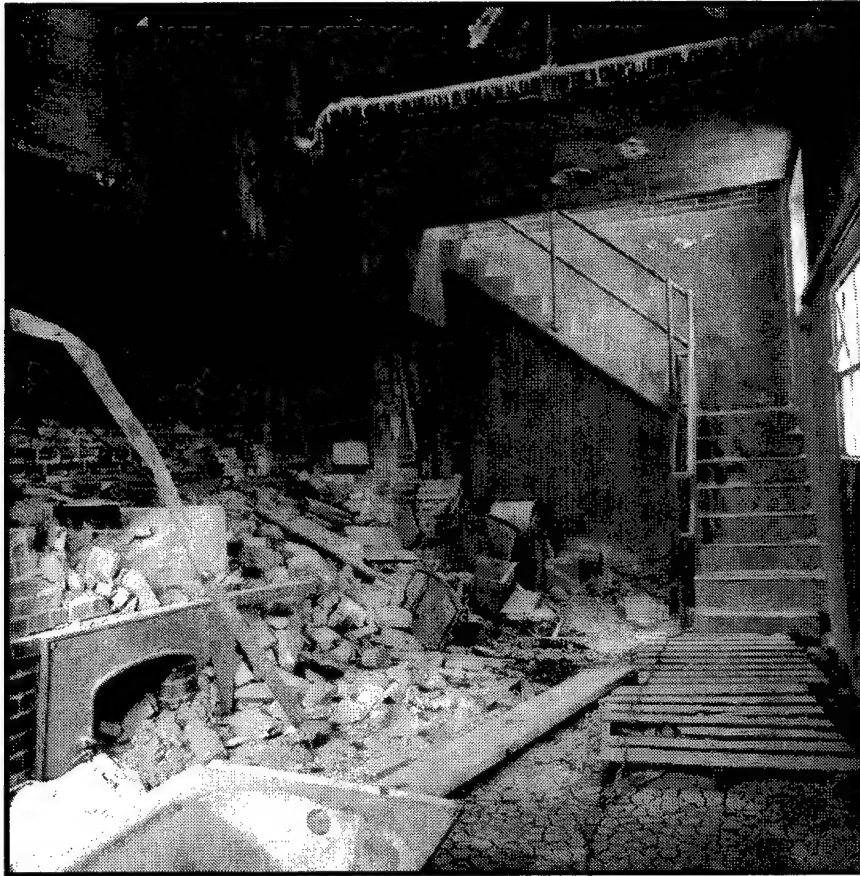


Figure II-82. Interior View of Basement at Incinerator 3850. View to the East. Remains of Incinerator Furnaces Visible in Photograph. Roll HH4, Exposure 8.



Figure II-83. Interior View of Second Level of Incinerator 3850. View to the West. Modern Incinerator and Garage Door Visible. Note Original Charging Doors in Floor Roll HH4, Exposure 11.

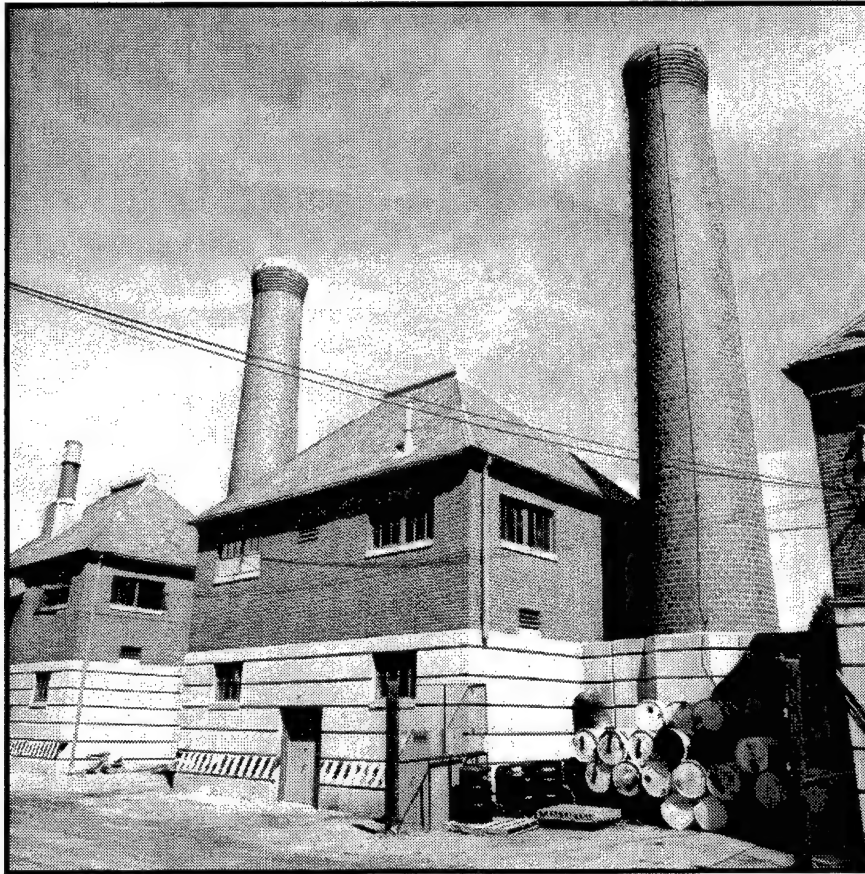


Figure II-84. 3/4 View of South and East Faces of Incinerator 3851. Roll HH5, Exposure 2.

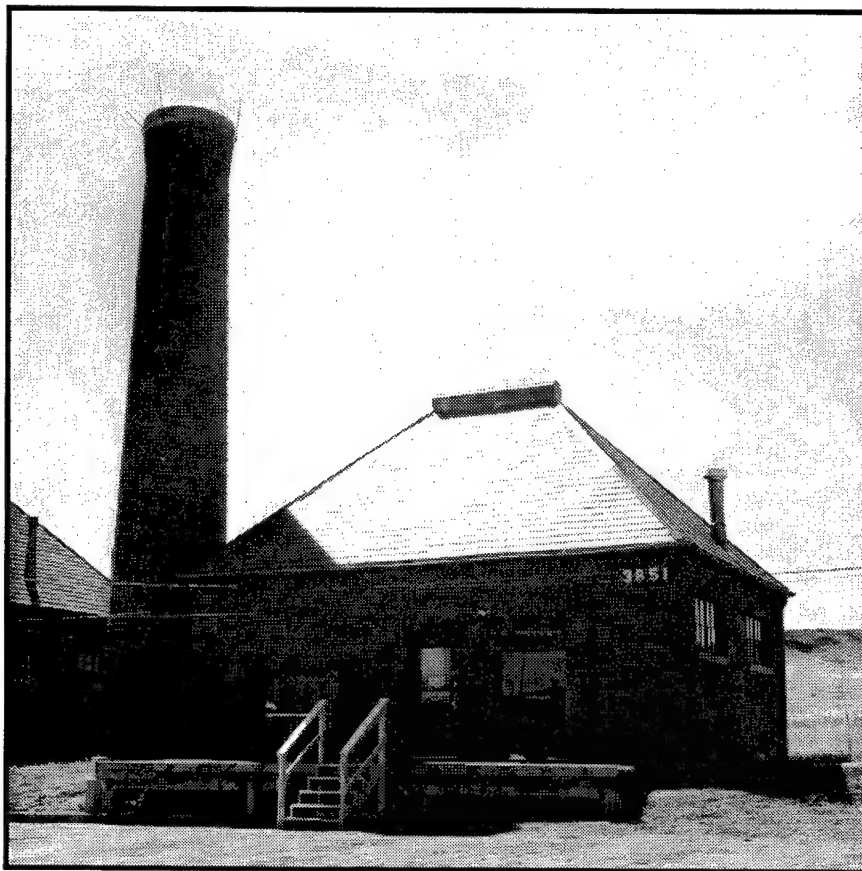


Figure II-85. 3/4 View of North and West Faces of Incinerator 3851. Roll HH5, Exposure 12.

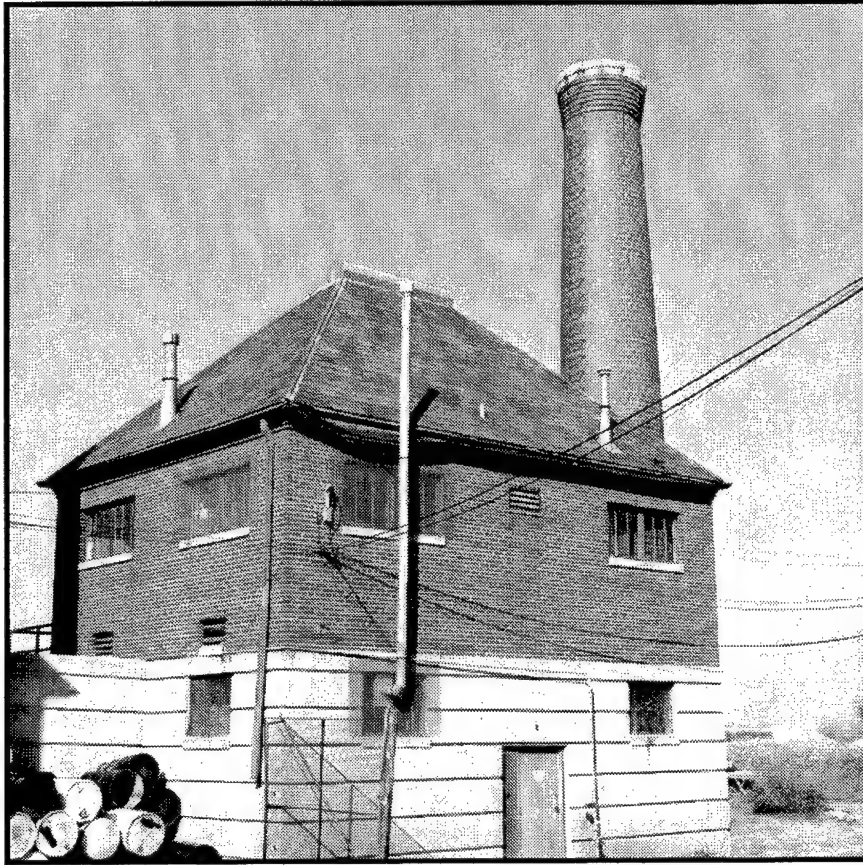


Figure II-86. 3/4 View of South and West Faces of Incinerator 3852. Roll HH2, Exposure 2.

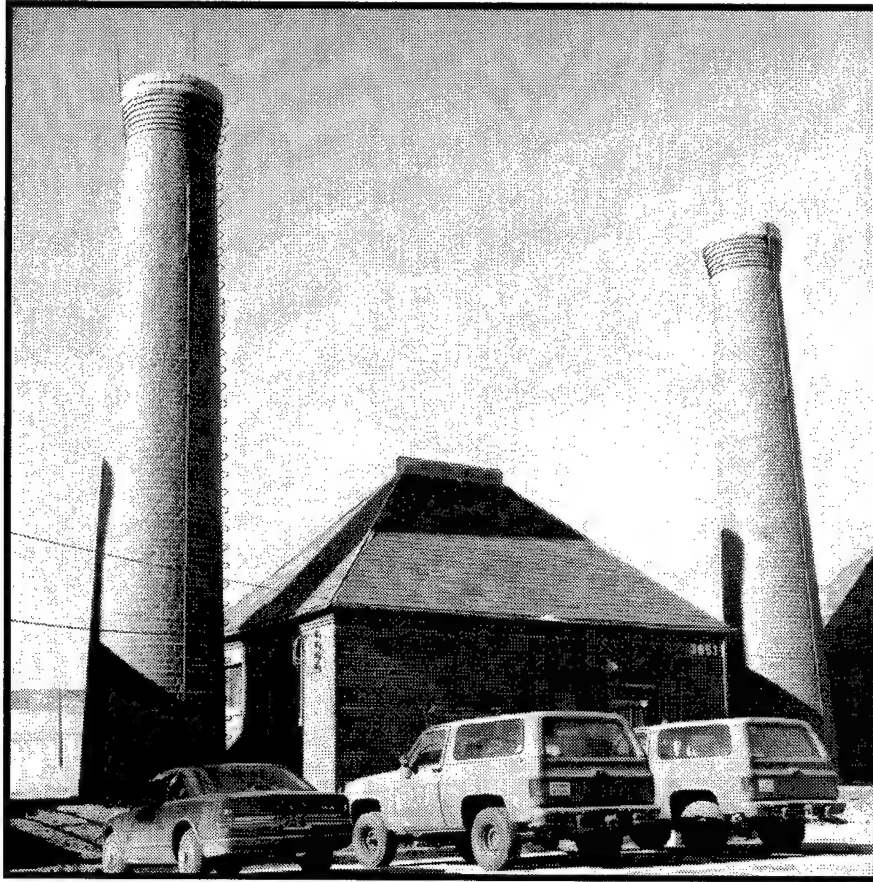


Figure II-87. 3/4 View of North and East Faces of Incinerator 3852. Loading Dock and Ramp in Foreground, Associated Chimney to Left. Roll HH3, Exposure 2.

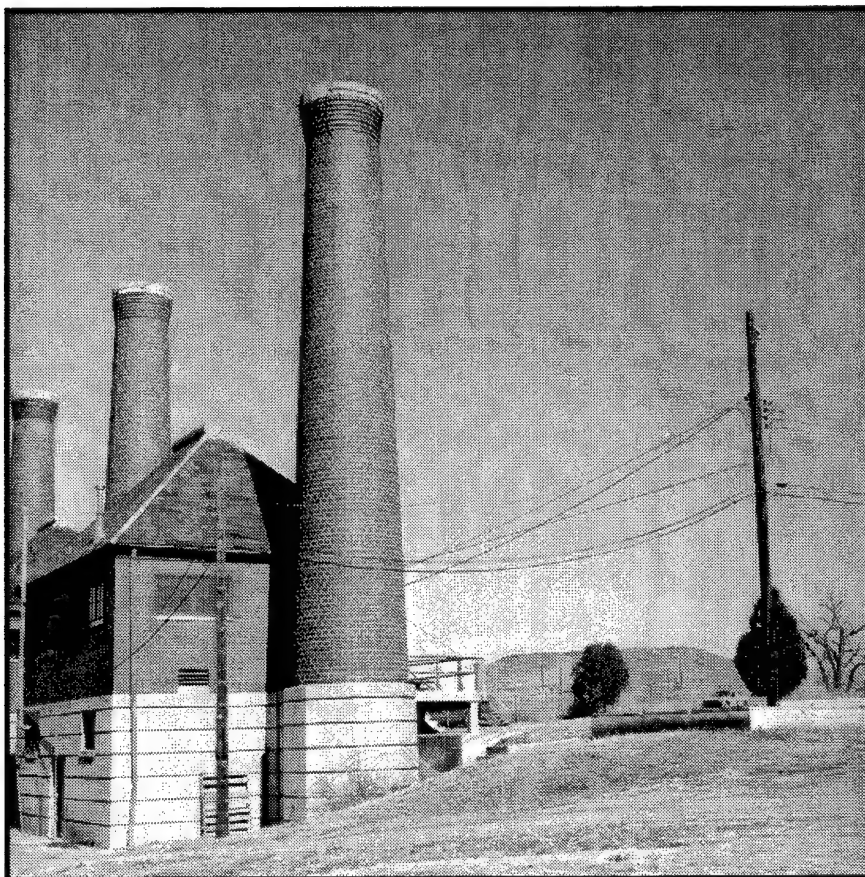


Figure II-88. 3/4 View of South and East Faces of Incinerator 3852. Grease Trap and Foundation of Incinerator Lavatory 3853 Visible to Right of Chimney. Roll HH4, Exposure 5.

MANAGEMENT SUMMARY

The Fort Carson Waste Water Treatment Plant and Incinerator Complex has been determined eligible for the National Register of Historic Places under Criterion C, a good example of a World War II military base waste water treatment plant. As a result of this determination, this report has been prepared. Detailed in this report are the 32 associated contributing buildings and the 33 associated non-contributing buildings at the site. Table III-1 defines each building or structure as contributing or non-contributing.

Contributing Building Summary

All treatment plants constructed in 1942 and 1943 were to be designed and constructed under guidelines for temporary military construction. Buildings could be constructed of brick, masonry, or wood.

Initial plans drawn by Fisher, Fisher and Hubbell Paulette and Wilson for the WWTP called for construction using poured concrete heavily reinforced with steel. "As-built" plans from 1943 indicate that, though still constructed of concrete, the amount of reinforcing steel used in most construction was cut roughly in half. Reinforced concrete is the predominant construction material used during all phases of plant development.

The clarifiers, diversion and collection boxes, filters, digesters and digester control room, Parshall flumes, and discharge chute are constructed of poured-in-place, steel-reinforced concrete walls and floors. The walls are typically 8" thick with chamfered lips. All are partially buried, with walls extending approximately 18" above grade. Handrails and gates were installed at most buildings in 1965. These consist of 2"-diameter pipe bolted to the wall lips with a round collar.

As constructed, clarifiers, diversion and collection boxes, filters, and Parshall flumes had no roofs or superstructures other than walkways and equipment housing. Digester Control Room 3862 had a poured-concrete roof. The digesters themselves had floating roofs constructed of metal trusses, wood sheathing, and asphalt roofing. The sludge holding tank had a fixed wood roof.

The buildings constructed during the 1943 expansion were essentially the same in design and construction as the 1942 improvements.

Laboratory and Control 3887 has wood frame construction. This building's design was based on Military Series 800 designs for temporary construction. It has concrete foundations and footings beneath its wood frame walls and rafters. The building has a moderate-pitched roof with slightly overhung eaves. In 1957, the temporary wood frame Screen House building was replaced with a structure that incorporated Concrete Masonry Unit (CMU) walls and a flat, concrete slab roof. Though also utilitarian in design and construction, the replacement building was a reflection of Fort Carson's permanent status.

The unornamented design of the buildings and their straightforward layout on the site are reflective both of standardized military construction of the time and of the utilitarian function of the complex. The WWTP is in good condition and has functioned continuously since its completion. The building's at-grade structures are painted white. Those buildings with superstructures are painted a creamy white with dark brown accent bands at their bases and cornice lines. Pipe railings, ladders, and stairs are painted bright yellow. Entrances to enclosed buildings, except for a loading dock at Screen House 3870, occur at grade.

The interiors of all enclosed buildings except for Laboratory and Control 3887 and Laboratory and Control 3900 are unfinished, with exposed block walls and polished concrete floors. Occupied spaces within buildings 3887 and 3900 are finished with modern paneling, asphalt tile flooring, and painted or drop ceilings. Exterior trim work occurs only on enclosed buildings, and is limited to a strip of metal flashing at the cornice line.

All three incinerators (3850, 3851, and 3852) are associated contributing buildings. The incinerators are rectangular buildings with steep hipped roofs. One tall round chimney sits adjacent to each incinerator. Raised concrete loading docks run the length of each building's north side. The incinerators have red brick walls. The red brick of the chimneys was formed to match the chimney radius. Each incinerator and associated chimney sits on a massive concrete foundation. The foundations have horizontal relief bands. The roofs have slate shingles, and their ridges are defined by large metal vents that run the length of the ridge. Each chimney has several courses of corbeled brick at its lip, topped with a concrete cap. Metal ladder rungs are imbedded into the chimney walls.

The incinerator complex is constructed against a hill. Each incinerator has two levels. The lower levels exit to grade. The upper levels exit to their loading docks, which are approximately 3' above grade. The Incinerator Lavatory 3853 was determined contributing in 1995 but demolished later the same year.

Non-Contributing Building Summary

The 33 associated non-contributing buildings and structures at the Waste Water Treatment Plant were all constructed after 1942. These non-contributing structures are all necessary functioning components of the WWTP, but are not original to the complex.

A cluster of buildings was constructed in or around 1965. Diversion Box 3894 has poured, reinforced concrete walls, foundation, and footings, and was built between 1961 and 1965. Built in 1965, Electrical Power Building 3874, Degritter 3872, and Grit Washer 3871 have concrete masonry unit walls and 6"-thick concrete roof slabs covered with insulation and built-up roofing. Entrances and window openings have steel lintels. Those improvements without roofs or superstructures have railings constructed of 1½"-diameter pipes.

Improvements constructed during the late 1970s and early 1980s used the same wall materials but incorporated heavy reinforcing. Construction of this era also utilized pre-cast,

reinforced double-"T" slabs for roofs. As before, these slabs were covered with insulation and built-up roofing.

In 1977 another group of buildings was constructed. These include the Chlorine Contact Chamber 3869 with its concrete and steel reinforced walls, and Chlorination Building 3867 and Emergency Generator Building 3868, constructed of concrete masonry units. Tertiary Filter 3897 was constructed around 1978 of concrete masonry units.

In 1980-1981, five structures were completed. These include Backwash Basin 3896 and the Flow Equalization Chamber, built of steel-reinforced concrete walls. Built of concrete masonry units were Sludge Pump Building 3880 and Lab and Control Building 3900. In addition, the Standby Generator Plant 3873 was built about 1980. This is a wood frame structure.

The most recent structure to be built is Sludge Bed 3866, completed in 1984. The bed and walls were constructed of concrete, unlike earlier sludge beds that were built with sand and gravel beds.

During fieldwork, both the Waste Water Treatment Plant (5EP2447) and the Incinerator Complex (5EP2446) were in good condition and were in use. The WWTP has been in continuous use since its initial operation. In the upgrade of the Plant scheduled for 1996, it is anticipated that these structures may be greatly altered or demolished. The Incinerator Complex is not scheduled for alteration at this time. However, as active plants serving the Fort Carson military community, continual changes and updates are to be expected.

Table III-1. Contributing and Non-Contributing Buildings		
Building	Construction Date	Determination
3850 Incinerator	1942	C
3851 Incinerator	1942	C
3852 Incinerator	1942	C
3853 Incinerator Lavatory	1942	C
3860 Primary Digester	1942	C
3861 Sludge Holding Tank	1942	C/D
3862 Digester Control Room	1942	C
3863 Secondary Digester	1942	C
3864 Sludge Bed	1942	C
3865 Sludge Bed	1942	C
3866 Sludge Bed	1984	NC
3867 Chlorine Building	1977	NC
3868 Emergency Generator Building	1977	NC
3869 Chlorine Contact Chamber	1977	NC
3870 Screen House	1942	C
3871 Grit Washer	1957?	NC
3872 Degritter	1957?	NC
3873 Standby Generator Building	1980/1981	NC
3874 Electrical Power Building	1965	NC
3875 Diversion Box	1942	C
3876 Primary Clarifier	1943	C
3877 Primary Clarifier	1942	C
3878 Diversion Box	1942	C
3879 Primary Clarifier	1942	C

3880 Primary Sludge Pump Building (original demolished in 1981)	1981	NC
3881 Trickling Filter	1943	C
3882 Filter Head Box	1943	C
3883 Trickling Filter	1943	C
3884 Trickling Filter	1942	C
3885 Filter Head Box	1942	C
3886 Trickling Filter	1942	C
3887 Laboratory and Control Building	1942	C
3888 Secondary Clarifier	1943	C
3889 Recirculation Well	1942	C
3890 Diversion Box	1943	C
3891 Diversion Box	1942	C
3892 Secondary Clarifier	1942	C
3893 Diversion Box/Parshall Flume	1942	C
3894 Diversion Box	1977	NC
3895 Secondary Clarifier	1942	C
3896 Backwash Basin	1981	NC
3897 Tertiary Filter Building	1977	NC
3899 Diversion Box	1977	NC
3900 Administration Building	1981	NC
5222 Sludge Bed	1943	D in 1943
Natural Gas Regulator and Methane Regulator PRV 30	1940s	C
Natural Gas Valve Box and Burner	1940s	C
Backwash Return Pump Station	1981	NC
Chlorine Injection Station	1977	NC
De-Chlorination Building	1977	NC

Effluent Parshall Flume	1993	NC
Electrical Transformers		NC
Emergency Eyewash Building	1977	NC
Filter Head Box Crane at 3882	1984	NC
Filter Head Box Crane at 3885	1984	NC
Flow Equalization Basin and 1981 headworks (including Comminutor and 2 Parshall Flumes)	1981	NC
Golf Course Irrigation Pump and Well	mid 1970s	NC
Grit Collector (outside site boundaries)		D
Headworks (Comminutor and Influent Parshall Flume)	1961	D in 1985
Incinerator Grease Trap	1942	D
Lagoon	1970s	D in 1977
Miscellaneous Manholes		NC
Outfall		NC
Sludge Valve Pit		NC
Sulfur Dioxide Tank Storage Building	1977	NC

C = Associated Contributing Building
 NC = Associated Non-Contributing Building
 D = Demolished

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War Department

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1945 War Department Technical Manual TM5-665. Operation of Sewerage and Sewage Treatment Facilities at Fixed Army Installations. United States Government Printing Office, Washington, D.C.

APPENDIX A

ARCHAEOLOGICAL MAPPING SPECIALISTS

Leaders in archaeological GIS, remote sensing, photogrammetry, & computer cartography

15 December 1996

Principals

Christopher D. Dore, Ph.D.

LuAnn Wandsnider, Ph.D.

Associates

Scott Richert, M.A.

Affiliates

Lewis Somers, Ph.D.

Authorized worldwide
reseller of the
Microlmages line of GIS
software products.

Ms. Melissa Connor
National Park Service
Midwest Archeological Center
Federal Building Room 474
100 Centennial Mall North
Lincoln, NE 68508-3873

Dear Melissa:

Enclosed you will find three copies each of two corrected and interpreted aerial photographs of the Fort Carson Wastewater Treatment Plant and a copy of a "fact sheet" that explains the details for the procedures that we used. This enclosed information completes the work contracted for by purchase order 1443PX61159600109.

Please let me know if you have any questions about this work. As you requested, we will archive this work until it is approved by the State Historic Preservation Officer. Note, however, that we always maintain permanent archives of all the work we do for you.

Thank you for this opportunity to work with the Park Service again.

Sincerely,



Christopher D. Dore
Principal

ARCHAEOLOGICAL MAPPING SPECIALISTS

Job Fact Sheet

Fort Carson Wastewater Treatment Plant Photogrammetric Drawings

Source Material

Data for this job came from the following sources:

- Fountain, Colorado USGS 7.5 minute series topographic map
- NAPP 1993 aerial photograph (6666-76, 06-26-93)
- NRCS 1955 aerial photograph
- Fort Carson Engineering Plans: 1943 (CCA-2-1), 1977 (71-07-14, sheets E-1 & C-3), 1992 (0807, sheet OF)

Scanning

All scanning for this job was done on an Hewlett Packard ScanJet 4c. All photographs were scanned at an optical resolution of 600 dots per inch (dpi) enhanced to 2400 dpi. The USGS map was scanned at an optical resolution of 400 dpi. The engineering plans were scanned at an optical resolution of 600 dpi.

Georeferencing

Georeferencing was accomplished using both absolute and relative techniques. First, the USGS Quad was georeferenced using four tick marks and longitude/latitude coordinates and the 1927 North American datum/Clarke 1866 ellipsoid. The USGS map was then reprojected to the UTM coordinate system, zone 13, also using the NAD 27/Clarke 1866 datum/ellipsoid.

Engineering plans were relatively georeferenced to the USGS Quad primarily using road intersections and architectural features. Aerial photographs were then relatively georeferenced to the engineering plans using approximately 15-20 points.

Correction

Aerial photographs were corrected to the UTM planametric coordinate system (NAD 27/Clarke 1866) using a two dimensional affine transformation. Resolution (pixel size) after correction was approximately 0.45 meters for the 1993 photograph and 0.15 meters for the 1955 photographs.

Interpretation

The identification of cultural features was done by tracing over the features in the corrected photographs. Only features that could be reasonably defined in the photographs were identified (see comments section below). The interpretation of features was done by referring to the engineering plans and supplemental information.

Printing

Layout and printing was done at a scale of 1:1,500. Prints used the UTM coordinate system, the NAD 27 datum, and the Clarke 1866 ellipsoid. Interpreted cultural features were printed over the corrected photographs for reference. Printing was done on an Epson Stylus Pro printer at a resolution of 720 x 720 dpi.

ARCHÆOLOGICAL MAPPING SPECIALISTS

Comments

The resolution of these photographs, and especially the 1993 one, is insufficient to identify and define anything with much accuracy or precision other than large structures (tanks and sludge pits). The resolution on the 1955 photograph is better, but not much. Structure definition does not improve even after substantial enhancement. The precision of these images is approximately 0.25 meters for the 1955 photograph and approximately 2.5 meters for the 1993 photograph. This means that, especially for the 1993 photograph, edges and corners can not be precisely defined.

In addition to problems with the precision, there are also problems with the accuracy. The degree of distortion in these photographs from obliqueness, lens effect, and particularly topographic displacement is large. With the number of common points available in the photographs, plans, and on the USGS map to use as "tie points", this distortion is too great to be removed by georeferencing the photographs to the USGS quad and correcting them through a two dimensional correction. This technique was the only choice, however, with the source material available.

Fort Carson
Waste Water Treatment Plant: 5EP2447
Features from 1955 Aerial Photograph

- Roadways
- Sludge Bed
- Structure
- Tank



0 10 20 30 40 50 meters

Scale 1:1500
UTM Zone 13
NAD27/Clarke 1866

Fort Carson.
Waste Water Treatment
Plant: 5EP2447.
Features from 1993
Aerial Photograph.

